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PROTECTIVE CLOTHING AND EQUIPMENT

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PROTECTIVE CLOTHING AND EQUIPMENT

TABLE OF CONTENTS

Paragraph	Page
List of Tables	vii
Glossary of Abbreviations Used	vii
Preface	ix
CHAPTER 1. INTRODUCTION	
1-1 The Occupational Safety and Health Act	1
1-2 Purpose and Scope	1
1-3 Arrangement of Pamphlet	1
CHAPTER 2. OCCUPATIONAL SAFETY AND HEALTH INFORMATION	
2-1 Introduction	3
2-2 <i>Federal Register</i> , Part 1910 — Occupational Safety and Health Standards — Subpart I — Personal Protective Equipment — Section 1910.132 — General Requirements	3
2-3 <i>Federal Register</i> , Part 1926 — Construction Safety and Health Regulations — Subpart C — General Safety and Health Provisions — Section 1926.20 and Subpart D — Occupational Health and Environmental Controls	3
2-4 Guide for OSHA Training	5
2-5 Recommended Material for OSHA Library	7
CHAPTER 3. RESPIRATORY HAZARDS AND PROTECTION	
3-1 Introduction	9
3-2 Classification of Respiratory Hazards and Respirators	9
3-3 Detection of Respiratory Hazards	9
3-3.1 Atmospheres Deficient in Oxygen	11
3-3.2 Atmospheres Contaminated with Irrespirable or Poisonous Substances	11
3-3.2.1 Gaseous and Vapor Contaminants	11
3-3.2.2 Particulate Contaminants	15
3-4 Selection of Respirators	16
3-4.1 Use of Respirators	18
3-4.2 Identification of Gas Mask Canisters	18
3-4.3 Safety Warning	19
3-5 Atmospheres Immediately Dangerous to Life	20
3-6 Atmospheres Not Immediately Dangerous to Life	26
3-7 Maintenance and Care of Respirators	30
3-7.1 General	30

*This pamphlet supersedes DA Pam 385-3, 10 September 1968.

TABLE OF CONTENTS (con.)

Paragraph	Page
3-7.2 Inspection	30
3-7.3 Cleaning and Disinfection	30
3-7.4 Repair	31
3-7.5 Storage	31
3-8 Special Problems	31
3-8.1 Corrective Lens with Full Facepiece	31
3-8.2 Eyewear with Half-Mask Facepiece	31
3-8.3 Respirator Use in Low Temperatures	31
3-8.4 Respirator Use in High Temperatures	32
3-8.5 Communications	32
3-8.6 Nonconventional Respirators	32
3-8.7 Other Limitations	33
3-9 Recommended Requirements for Codes	33
3-9.1 Purpose	33
3-9.2 Permissible Practice	33
3-9.3 Employer Responsibility	33
3-9.4 Employee Responsibility	33
3-9.5 Minimal Acceptable Program	33
3-9.6 Program Administration	34
3-9.7 Medical Limitations	34
3-10 The National Institute for Occupational Safety and Health (NIOSH) Notice Promulgated 1974: Respiratory Protective Devices	34
3-10.1 Breathing Air Quality	34

CHAPTER 4. PROTECTION FOR THE HEAD, FACE, EYE, AND EAR

4-1 Introduction to Head Protection	35
4-1.1 Special Purpose Protective Body Clothing, Ensembles, and Suits for the Head, Face, Eye, and Ear — Cross Reference	35
4-2 American National Standards Institute Safety Requirements for Industrial Head Protection	35
4-3 Protective Clothing and Equipment for the Head	36
4-3.1 Recommendations Concerning Head Protection	38
4-4 Introduction to Face Protection	39
4-4.1 American National Standards Institute Safety Requirements for Industrial Eye and Face Protection	39
4-5 Protective Equipment for the Face	40
4-6 Introduction to Eye Protection	41
4-6.1 Protective Equipment for the Eye	41
4-6.2 Maintenance and Disinfection of Eye Protectors	44
4-7 Introduction to Ear Protection	44
4-7.1 Protective Equipment for the Ear	45
4-7.2 Maintenance and Disinfection of Ear Protectors	46
4-7.3 Selected Portions from Department of the Army Technical Bulletin TB Med 251, "Noise and Conservation of Hearing"	46

TABLE OF CONTENTS (con.)

Paragraph	Page
-----------	------

CHAPTER 5. PROTECTIVE BODY CLOTHING

5-1	Introduction	48
5-1.1	Special Purpose Protective Body Clothing, Ensembles, and Suits — Cross Reference	49
5-2	Limited Protective Body Clothing	49
5-3	Specific Protective Body Clothing	49
5-4	Maintenance, Laundering, and Fitting Instructions	56
5-4.1	Maintenance	56
5-4.2	Chemical Protection	56
5-4.3	Explosives	56
5-4.4	Fire Resistance	56
5-4.5	Laundering	56
5-4.6	Fitting Instructions	56

CHAPTER 6. PROTECTIVE FOOTWEAR

6-1	Introduction	57
6-1.1	Special Purpose Protective Body Clothing, Ensembles, and Suits for Foot Protection — Cross Reference	57
6-2	Specific Items of Protective Footwear	58
6-3	American National Standards Institute Standard for Men's Safety Toe Footwear	63
6-4	Maintenance and Fitting Instructions	63

CHAPTER 7. PROTECTIVE HANDWEAR

7-1	Introduction	64
7-1.1	Special Purpose Protective Body Clothing, Ensembles, and Suits — for Hand Protection — Cross Reference	64
7-2	Specific Items of Protective Handwear	64
7-3	Maintenance of Handwear	68

CHAPTER 8. SAFETY BELTS, LIFELINES, AND LIFESAVING EQUIPMENT

8-1	Introduction: Selected Portions of OSHA Standards, Part 1926 — Safety and Health Regulations for Construction — Subpart E — Personal Protective and Lifesaving Equipment	70
8-2	Specific Items for Safety and Lifesaving	71

CHAPTER 9. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR AVIATION

9-1	Air Pilots, Crews, and Passengers	74
-----	---	----

TABLE OF CONTENTS (con.)

Paragraph	Page
9-2 Specific Items for Aviation	74
CHAPTER 10. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR BIOLOGICAL HAZARDS	
10-1 Introduction	78
10-2 Selected Portions of OSHA Standards, Part 1910 — Occupational Safety and Health Standards — Subpart R — Special Industries	78
10-3 Selected Portions of OSHA Standards, Part 1910 — Occupational Safety and Health Standards — Subpart G — Occupational Health and Environmental Control	78
10-3.1 Physiological Stress Imposed by Protective Clothing Systems	79
10-4 Laboratory Safety	80
10-4.1 OSHA Biological Hazard Tags	80
10-5 Specific Items for Biological Protection	81
10-6 Clothing and Equipment for Biological Hazards	82
10-7 Hazards Associated with Biological Hazards	82
10-8 Handlers of Toxicological Agents	83
CHAPTER 11. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR CHEMICAL HAZARDS	
11-1 Introduction	84
11-2 Selected Portions of OSHA Standards, Part 1910 — Subpart H — Hazardous Materials — Related to Handling Chemicals	84
11-3 Laboratory Safety	85
11-4 Specific Items for Protection Against Chemicals	85
11-5 Clothing and Equipment for Chemical Hazards	88
11-6 Hazards Associated with Chemicals	89
11-7 Handlers of Chemical Agents and Vesicant Gases	89
11-8 Handlers of Toxic Chemical Agents	91
11-9 Handlers of Chemical Agents in Munitions Plants	92
CHAPTER 12. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR CONSTRUCTION AND DEMOLITION	
12-1 Introduction	93
12-2 Selected Portions of OSHA Standards for Construction, Part 1926 — Safety and Health Regulations for Construction	93
12-3 General Protective Clothing and Equipment for Construction and Demolition	94
12-4 Hazards Associated with Construction and Demolition	94

TABLE OF CONTENTS (con.)

Paragraph	Page
CHAPTER 13. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR ELECTRICAL HAZARDS	
13-1	Introduction 95
13-2	Selected Portions of OSHA Standards — Subpart S — Electrical Equipment and NFPA or ANSI Standards 95
13-3	Retest Schedule for Rubber Gloves 97
13-4	Specific Items for Protection Against Electricity 97
13-5	General Protective Clothing and Equipment for Electricity 101
13-6	Hazards Associated with Electrical Activity 102
CHAPTER 14. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR FIRE, HEAT, AND EXPLOSION	
14-1	Introduction 103
14-2	Selected Portions of OSHA Standards — Subpart L — Fire Protection 103
14-2.1	Selected Portions of OSHA Standards, Part 1910 — Occupational Safety and Health Standards — Subpart H — Hazardous Materials — Compressed Gases . . 105
14-3	OSHA Standards for Portable Fire Extinguishers 105
14-3.1	Markings of Fire Extinguishers 106
14-4	Color Coding of Containers of Flammables 106
14-5	Specific Items for Fire, Heat and Explosion Protection 106
14-6	General Protective Clothing and Equipment for Fire, Heat, and Explosion 117
14-7	Hazards Associated with Fire, Heat, and Explosion 117
CHAPTER 15. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR EXTREME TEMPERATURE AND WEATHER CONDITIONS	
15-1	Introduction 119
15-2	Specific Items for Extreme Temperature and Weather Protection 119
15-3	General Protective Clothing and Equipment for Extreme Temperature and Weather Conditions 127
15-4	Protective Ointments and Creams 128
15-5	Hazards Associated with Extreme Temperatures 128

TABLE OF CONTENTS (con.)

Paragraph		Page
CHAPTER 16. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR PROTECTION AGAINST RADIANT ENERGY		
16-1	Introduction . . . . .	.129
16-2	Specific Items for Radiant Energy and Light Energy Protection . . . . .	.131
16-3	Clothing and Equipment for Radiation Hazards . . . . .	.135
16-4	Hazards Associated with Radiant Energy and Light Energy . . . . .	.136
16-5	Selected Portions OSHA Standards — Construction Safety and Health Regulations — Subpart E — Personal Protective and Life Saving Equipment — Laser Protection . . . . .	.137
16-6	OSHA Radiation Warning Signs . . . . .	.137
16-7	OSHA Electromagnetic Standards and Warning Symbol . . . . .	.137
16-8	Laser Radiation Warning Symbol . . . . .	.138
CHAPTER 17. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR HANDLING FUEL		
17-1	Introduction . . . . .	.140
17-2	Selected Portions of OSHA Standards, Part 1926 — Safety and Health Regulations for Construction — Subpart F — Fire Protection and Prevention . . . . .	.140
17-3	Specific Items for Fuels . . . . .	.141
17-4	Clothing and Equipment for Fuel Handlers . . . . .	.142
17-5	Hazards Associated with Fuel Handling . . . . .	.144
17-6	Rocket Fuel Handlers . . . . .	.144
CHAPTER 18. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR TRANSPORTATION		
18-1	Introduction . . . . .	.145
18-2	Construction Safety Act Transportation Safety Requirements . . . . .	.145
18-3	Specific Items for Transportation . . . . .	.146
18-4	General Protective Clothing and Equipment for Transportation Activities . . . . .	.149
18-5	Hazards Associated with Transportation Activities . . . . .	.149
18-6	Ensemble, Reflective Safety Clothing Market . . . . .	.149
18-7	Selected Portions OSHA Standards — <i>Federal Register</i> — Part 1926 — Construction Safety and Health Regulations — Subpart G — Signs, and Barricades, Section 1926.200 — Accident Prevention Signs and Tags . . . . .	.150

TABLE OF CONTENTS (con.)

Paragraph		Page
CHAPTER 19. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR MATERIAL HANDLING AND STORAGE		
19-1	Introduction	152
19-2	Selected Portions of OSHA Standards, Part 1910 — Occupational Safety and Health Standards — Subpart N — Materials Handling and Storage	152
19-3	Materials Handling Guide	153
19-4	Specific Items for Material Handling and Storage Activities	154
19-5	General Protective Clothing and Equipment for Material Handling and Storage Operations	157
19-6	Hazards Associated with Materials Handling and Storage Activities	158
19-7	Selected Portions of OSHA Standards, Part 1926 — Construction Safety and Health Regulations — Subpart N — Cranes, Derricks, Hoists, Elevators, and Conveyors — Subpart 1926.551 — Helicopters	158
CHAPTER 20. MISCELLANEOUS SAFETY EQUIPMENT		
20-1	Introduction	160
20-2	Specific Items for Miscellaneous Safety Equipment	160
APPENDIX A — Safety Directory		167
APPENDIX B — Safety Item Index		171

LIST OF TABLES

Table No.	Title	Page
3-1	Classification of Respiratory Hazards According to their Biological Effect	10
1-1	Color Code for Gas Mask Canister	19
3-2	Guide for Selection of Respirators	17
4-1	Recommended Eye and Face Protectors	42
4-2	Selection of Shade Numbers for Welding Filters	43
1	Occupational Noise Exposure	47
14-1	Characteristics of Fire Extinguishers	118
E-3	Laser Protection OSHA E-3	137
G-1	Signs, Signals, and Barricades OSHA G-1	151

GLOSSARY OF ABBREVIATIONS USED

ABC	—automatic brightness control
AC	—alternating current
AG	—Adjutant General
AMC	—Army Materiel Command
AMEDD	—Army Medical Department
AN	—Army-Navy
ANSI	—American National Standards Institute
ARADCOM	—U.S. Army Air Defense Command
ASTM	—American Society for Testing and Materials
BW	—biological warfare
CB	—chemical-biological
CBR	—chemical-biological-radiological
CFR	—Code of Federal Regulations
CONUS	—Continental United States
CTA	—Common Table of Allowances
CVEH	—combat vehicle
CW	—chemical warfare
DA	—Department of the Army
dB	—decibel
DC	—direct current
DOP	—dioctyl phthalate

GLOSSARY OF ABBREVIATIONS USED (con.)

EM	—enlisted men
EMD	—electric-motor-driver
FA	—field artillery
Fed Spec	—Federal Specifications
FED STD	—Federal Standard
FSC	—Federal Supply Classification
FSCC	—Federal Supply Classification Catalog
GED	—gasoline-engine-driver
GM	—guided missile
ILO	—in lieu of
LIN	—line item number
MACOM	—Major Army Command
MEDDAC/ Med Cen	—Medical Department Activity/Medical Center
MESA	—Mine Engineering Safety Association
MIL-S	—Military Specification
MIL SPEC	—Military Specification
MOS	—Military Occupational Specialty
MP	—Military Police
NFPA	—National Fire Protection Association
NIOSH	—National Institute of Occupational Safety and Health
NOA	—not otherwise authorized
NSN	—national stock numbers
OG	—olive green
OSHA	—Occupational Safety and Health Act
OV	—on vehicle
PLUCON	—plutonium decontamination emergency team
PM	—preventive maintenance or Provost Marshal
PVNT MED	—preventive medicine
PWP	—plasticized white phosphorous
QM	—Quartermaster
RADCON	—radiation decontamination emergency team
RMS	—root mean square
SB	—safety bulletin
Spec JAN	—Specifications Joint Army Navy
TA	—Table of Allowances
TAP	—toxicological agents protective
TB CML	—Technical Bulletin Chemical
TB MED	—Technical Bulletin Medical
TM	—Technical Manual
TOE	—Table of Organization and Equipment
UL	—Underwriters' Laboratories, Inc.
WAB	—with approval by
WABCO	—with approval by Commanding Officer
WBG	—wet-bulb globe temperature
WP	—white phosphorous

PREFACE

This revision replaces Department of the Army Pamphlet 385-3, published in September 1968. Changes introduced to the revision of the pamphlet are:

- (1) Assignment of chapters to individual portions of the body requiring general protective clothing and equipment, e.g., respiratory protection.
- (2) Assignment of chapters to specific hazards for which protective clothing and equipment is recommended, e.g., electrical hazards.
- (3) Introduction of a new and separate chapter 9 of protective clothing and equipment for aviation.
- (4) Addition of selected Occupational Safety and Health Administration (OSHA) standards as well as other standards of the safety industry promulgated by nationally recognized authorities, e.g., American National Standards Institute (ANSI).
- (5) Addition of new appendix A, "Safety Directory," a list of nationwide manufacturers, and suppliers of protective clothing and safety equipment.
- (6) Revision of Safety Item Index into the new appendix B.
- (7) Incorporation of sections of previous pamphlet entitled "Maintenance" and "Other Specialized Activities" within chapters of the revision.

The purpose and scope of this pamphlet, together with pamphlet arrangement, is discussed in paragraphs 1-2 and 1-3 of chapter 1.

The proponent agency of this pamphlet is the U.S. Army Materiel Development and Readiness Command, ATTN: DRCSF-E, 5001 Eisenhower Avenue, Alexandria, Virginia 22333. The activity assigned action for revision is the U.S. Army Natick Research and Development Command, Natick, Massachusetts 01760. The revision was prepared by the Research Triangle Institute, Research Triangle Park, North Carolina.

Users are invited to send comments and suggested improvements to:

Commander, U.S. Army Natick Research and
Development Command
ATTN: DRXNM-EM
Natick, MA 01760

Certain portions of this pamphlet are reproduced where indicated by footnote by permission of the American National Standards Institute:

ANSI Z88.2—1969 — Respiratory Protection

ANSI Z89.1—1969 — Industrial Head Protection

ANSI Z87.1—1968 — Eye and Face Protection

ANSI Z41.1—1967(R—1972) — Safety Toe Footwear

Copies of the above may be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018.

NOTICE

Names of commercial manufacturers, trade names, product photographs, or illustrations are provided as illustrative examples only. Their inclusion in this pamphlet does not imply indorsement by the Army, nor does the exclusion of other commercial manufacturers' names and trade names imply nonindorsement by the Army. This pamphlet is provided as a guide to basic, representative types of equipment and sources only, and should not be considered as an all-inclusive product or source listing.

CHAPTER 1. INTRODUCTION

1-1 THE OCCUPATIONAL SAFETY AND HEALTH ACT

An Executive Order signed by the President on 28 September 1974, effective 1 November 1974, implemented new regulations for occupational health and safety of Federal employees.

The new rules require Federal departments and agencies to maintain logs of occupational injuries, illnesses, and deaths. Serious accidents resulting in fatalities, hospitalization of five or more workers, or property damage of \$100,000 or more must be reported to OSHA within two working days. Other requirements of the new rules include:

- Each agency head must appoint an official of the rank of Assistant Secretary or equivalent to head the agency occupational health and safety program.
- Workplace inspections should be conducted by "personnel with sufficient technical competence to recognize unsafe or unhealthful working conditions." Employees may report unhealthful or unsafe conditions or may request an inspection of the workplace.
- Imminent danger provisions in the rules call for immediate abatement of the danger or withdrawal of affected workers from exposure to the hazard.
- To assure unsafe conditions are corrected, reinspections, where practicable, will be conducted.
- Occupational safety and health standards for Federal agencies must provide protection for Federal employees "at least as effective as" that offered by OSHA standards for the private sector.
- Field Federal safety and health councils will be continued to facilitate the exchange of ideas and information throughout the Government on matters of occupational safety and health.

The Secretary of the Army and Headquarters, AMC have recently reemphasized the importance of the Army's compliance with the Occupational Safety and Health Act (OSHA).

1-2 PURPOSE AND SCOPE

The purpose and scope of this pamphlet is threefold:

- To provide the Safety Director, Supervisor, the Inspector, and the Worker with a guide for the use and care of recognized occupational safety clothing and equipment arranged in chapters according to usage.
- To provide guidance to the Safety Director, the Supervisor, the Inspector, and the Worker with selected portions of the Occupational Safety and Health standards as well as selected portions of other standards recognized by the Occupational Safety and Health Administration.
- To promote the fact that provision of a safe and healthy place to work, including the wearing of protective equipment, is the foundation for every successful safety program.

It is emphasized that this pamphlet is a guide only. Because of the hundreds of products of safety clothing and equipment and the many variations thereof in size, shape, and use, this pamphlet does not list all safety clothing and equipment available through either Government or commercial sources. Therefore, the user is encouraged to consult other safety directories, manuals, and/or local OSHA offices when encountering a condition or hazard not covered in this pamphlet. Further, appendix C of SB700-20, CTA 50-900, and CTA 50-970 should be reviewed for specific items within the Department of the Army supply system. The user is cautioned to consult applicable regulations in each case. In instances where current regulations are in conflict with references or standards quoted in this pamphlet, the current regulation has precedence.

1-3 ARRANGEMENT OF PAMPHLET

Chapter 1 — Introduction

Chapter 2 — Contains the OSHA general requirements for personal protective equipment for safety and health, a guide for OSHA training requirements, and a recommended list of items for an OSHA library.

Chapters 3 through 8 — Contain items of "general protective clothing and equipment"

that are applicable to several types of hazards. For example, respiratory protection may be required for such hazards as chemicals, biological agents, dust and smoke, fuel fumes, paint spray, gaseous contaminants, toxicological agents, etc.

Chapter 9 — Contains items of special protective clothing and equipment for aviation.

Chapters 10 through 19 — Contain items of "special protective clothing and equipment" for specific categories of hazards. In these chapters, applicable items of clothing and equipment are listed that protect against a specific hazard. Also listed are clothing and equipment items of a general nature which are recommended for use against a specific hazard. A further section within chapters 10 through 19 is entitled "Additional Hazards Associated With (name of specific hazard)" and is designed as a cross-reference to assist the user.

Chapter 20 — Miscellaneous Safety Equipment — Contains a series of items which are general in nature and have broad application in the field of safety rather than being specifically confined to one area.

Appendix A — Safety Directory — This appendix contains a list of typical companies that manufacture, distribute, or supply protective clothing and safety equipment. This list is provided only as a guide to representative types of sources of the protective clothing and safety equipment available under each heading. The list is not complete and should not be considered either complete or all-inclusive. Users of this pamphlet should consult local telephone directories, and local supply catalogs for manufacturers, distributors, suppliers, and other sources of protective clothing and safety equipment. Names of manufacturers and trade names are provided as representative examples only. Their inclusion in this pamphlet does not imply indorsement by the Army, nor does the exclusion of other manufacturers' names or trade names imply nonindorsement by the Army. The head-

ings in the appendix correspond to the chapter headings found in this pamphlet.

Appendix B — Safety Item Index — Is an alphabetical listing of the Safety Items in this pamphlet.

General — Where possible, for each item, the military nomenclature from SB700-20, Department of the Army Supply Bulletin which became effective 1 March 1975, Common Table of Allowances (CTA) 50-900 dated 15 November 1973, and Common Table of Allowances (CTA) 50-970 dated 1 July 1974, have been followed in describing the item. Most items will indicate a source, a use, and where appropriate a limitation or warning as to use. For some items, the military or generic nomenclature will be sufficient to indicate use. In a limited number of items, the Military or Federal Specifications have been cited as the source. The basic source documents for Line Items Numbers (LIN) are appendix C of SB700-20 and CTA 50-900. The National Stock Numbers (NSN) are taken from SB700-20 and CTA 50-970.

For those items whose source is shown in appendix A of this pamphlet, the generic nomenclature has been utilized to permit procurement of appropriate variations of items where peculiar characteristics are required for the performance of specified functions.

The user will note that certain items appear in more than one chapter, since some items protect against more than one hazard. In addition, some items have been duplicated to provide the user with more complete coverage and cross-reference for protection against a specific hazard, e.g., protective clothing and equipment for fuel handlers. For specific items, consult the Appendix B — Safety Item Index.

Reference numbers for Technical Manuals and Technical Bulletins were provided by DA Pamphlet 310-4-Index of Technical Manuals, Technical Bulletins of August 1973, Change 3.

CHAPTER 2. OCCUPATIONAL SAFETY AND HEALTH INFORMATION

2-1 INTRODUCTION

The Occupational Safety and Health Administration (OSHA) standards are not static. Since their first compilation, the published standards have been under review for the correction of errors and to make substantive additions, deletions, and revisions that will bring requirements more closely into line with the original Act and with subsequent changes in consensus standards.

Thus, Federal employers must expect a continual updating of the OSHA standards to reflect increased knowledge about hazardous operations, equipment or materials, and technical advances in coping with occupational dangers.

The OSHA sources of standards, for the most part, are based on standards published by nationally recognized organizations concerned with occupational safety and health. Some of the organizations and their abbreviations appearing in this pamphlet are:

- NFPA — National Fire Protection Association
- ANSI — American National Standards Institute
- ASTM — American Society for Testing and Materials
- UL — Underwriter Laboratories, Inc.

The selected portions of OSHA standards used in the various chapters of this pamphlet are reproduced, in part, from the following publications:

- *Federal Register* — OSHA — Construction Safety and Health Regulations — Part 1926 — 24 June 1974
- *Federal Register* — OSHA — Occupational Safety and Health Standards — Part 1910 — 27 June 1974

2-2 FEDERAL REGISTER PART 1910 — OCCUPATIONAL SAFETY AND HEALTH STANDARDS — SUBPART I — PERSONAL PROTECTIVE EQUIPMENT — SECTION 1910.132 — GENERAL REQUIREMENTS

“(a) *Application*. Protective equipment,

including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

“(b) *Employee-owned equipment*. Where employees provide their own protective equipment, the employer shall be responsible to assure its adequacy, including proper maintenance, and sanitation of such equipment.

“(c) *Design*. All personal protective equipment shall be of safe design and construction for the work to be performed.”

2-3 FEDERAL REGISTER, PART 1926 — CONSTRUCTION SAFETY AND HEALTH REGULATIONS — SUBPART C — GENERAL SAFETY AND HEALTH PROVISIONS — SECTION 1926.20 AND SUBPART D — OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROLS

Subpart C — General Safety and Health Provisions

§ 1926.20 General safety and health provisions.

“*Accident prevention responsibilities*. (1) It shall be the responsibility of the employer to initiate and maintain such programs as may be necessary to comply with this part.

“(2) Such programs shall provide for frequent and regular inspections of the job sites, materials, and equipment to be made by competent persons designated by the employers.

“(3) The use of any machinery, tool, material, or equipment which is not in compliance with any applicable requirement of this part is prohibited. Such machine, tool, material, or equipment shall either be identified as unsafe by tagging or locking the controls to render them inoperable or shall be physically removed from its place of operation.

“(4) The employer shall permit only those employees qualified by training or experience to operate equipment and machinery.”

§ 1926.21 Safety training and education.

“Employer responsibility. (1) The employer should avail himself of the safety and health training programs the Secretary provides.

“(2) The employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury.

“(3) Employees required to handle or use poisons, caustics, and other harmful substances shall be instructed regarding the safe handling and use and be made aware of the potential hazards, personal hygiene, and personal protective measures required.

“(4) In job site areas where harmful plants or animals are present, employees who may be exposed shall be instructed regarding the potential hazards, and how to avoid injury, and the first aid procedures to be used in the event of injury.

“(5) Employees required to handle or use flammable liquids, gases, or toxic materials shall be instructed in the safe handling and use of these materials and made aware of the specific requirements contained in Subparts D, F, and other applicable subparts of this part.

“(6) (i) All employees required to enter into confined or enclosed spaces shall be instructed as to the nature of the hazards involved, the necessary precautions to be taken, and in the use of protective and emergency equipment required. The employer shall comply with any specific regulations that apply to work in dangerous or potentially dangerous areas.

“(ii) For purposes of paragraph (b) (6) (i) of this section, “confined or enclosed space” means any space having a limited means of egress, which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere. Confined or enclosed spaces include, but are not limited to, storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than 4 feet in depth such as pits, tubs, vaults and vessels.”

§ 1926.22 Recording and reporting of injuries. [Reserved]

§ 1926.23 First aid and medical attention.

“First aid services and provisions for medical care shall be made available by the employer for every employee covered by these regulations. Regulations prescribing specific requirements for first aid, medical attention, and emergency facilities are contained in Subpart D of this part.”

§ 1926.24 Fire protection and prevention.

“The employer shall be responsible for the development and maintenance of an effective fire protection and prevention program at the job site throughout all phases of the construction, repair, alteration, or demolition work. The employer shall ensure the availability of the fire protection and suppression equipment required by Subpart F of this part.”

§ 1926.25 Housekeeping.

“(a) During the course of construction, alteration, or repairs, form and scrap lumber with protruding nails and all other debris shall be kept cleared from work areas, passageways, and stairs in and around buildings or other structures.

“(b) Combustible scrap and debris shall be removed at regular intervals during the course of construction. Safe means shall be provided to facilitate such removal.

“(c) Containers shall be provided for the collection and separation of waste, trash, oily and used rags, and other refuse. Containers used for garbage and other oily, flammable, or hazardous wastes, such as caustics, acids, harmful dusts, etc., shall be equipped with covers. Garbage and other waste shall be disposed of at frequent and regular intervals.”

§ 1926.26 Illumination.

"Construction areas, aisles, stairs, ramps, runways, corridors, offices, shops, and storage areas where work is in progress shall be lighted with either natural or artificial illumination. The minimum illumination requirements for work areas are contained in Subpart D of this part."

§ 1926.27 Sanitation.

"Health and sanitation requirements for drinking water are contained in Subpart D of this part."

§ 1926.28 Personal protective equipment.

"(a) The employer is responsible for requiring the wearing of appropriate personal protective equipment in all operations where there is an exposure to hazardous conditions or where this part indicates the need for using such equipment to reduce the hazards to the employees.

"(b) Regulations governing the use, selection, and maintenance of personal protective and lifesaving equipment are described under Subpart E of this part."

Subpart D — Occupational Health and Environmental Controls

§ 1926.50 Medical services and first aid.

"(a) The employer shall insure the availability of medical personnel for advice and consultation on matters of occupational health.

"(b) Provisions shall be made prior to commencement of the project for prompt medical attention in case of serious injury.

"(c) In the absence of an infirmary, clinic, hospital, or physician, that is reasonably accessible in terms of time and distance to the worksite, which is available for the treatment of injured employees, a person who has a valid certificate in first-aid training from the U.S. Bureau of Mines, the American Red Cross, or equivalent training that can be verified by documentary evidence, shall be available at the worksite to render first aid.

"(d) (1) First-aid supplies approved by the consulting physician shall be easily accessible when required.

"(2) The first-aid kit shall consist of materials approved by the consulting physician in a weatherproof container with individual sealed packages for each type of item. The contents of

the first-aid kit shall be checked by the employer before being sent out on each job and at least weekly on each job to ensure that the expended items are replaced.

"(e) Proper equipment for prompt transportation of the injured person to a physician or hospital, or a communication system for contacting necessary ambulance service, shall be provided.

"(f) The telephone numbers of the physicians, hospitals, or ambulances shall be conspicuously posted."

2-4 GUIDE FOR OSHA TRAINING

The OSHA standards establish training requirements for employees in specific areas of operation. The details of these training requirements make repeated reference to the wearing and use of appropriate **"personal protective clothing and equipment"** in all areas of operation. When visited by an OSHA compliance officer or other competent inspecting authority, the employer should be able to produce evidence or records indicating that his employees have received training in applicable areas. This guide is designed to assist the Safety Director, the Inspector, the Supervisor, Medical Personnel, and the Worker in finding the appropriate reference for particular or related military endeavors.

"Section 1910.1001—Asbestos: (d)(iv)(a) instruction and training in use of respiratory protection equipment, as required under 1910.134 (see below)

"Section 1910.1003—4-Nitrobiphenyl: (e)(5) carcinogen training and indoctrination program before authorization to enter a regulated area

"Section 1910.1004—alpha-Naphthylamine: (e)(5) carcinogen training and indoctrination program before authorization to enter a regulated area

"Section 1910.1005—4.4'-Methylene bis(2-chloroaniline): (e)(5) carcinogen training and indoctrination before authorization to enter a regulated area

"Section 1910.1006—Methyl Chloromethyl Ether: (e)(5) carcinogen training and indoctrination program before authorization to enter a regulated area

“Section 1910.1007—3,3'-Dichlorobenzidine and Its Salts: (e)(5) carcinogen training and indoctrination program before authorization to enter a regulated area

“Section 1910.1008—bis-Chloromethyl Ether: (e)(5) carcinogen training and indoctrination program before authorization to enter a regulated area

“Section 1910.1009—beta-Naphthylamine: (e)(5) carcinogen training and indoctrination program before authorization to enter regulated area

“Section 1910.1010—Benzidine: (e)(5) carcinogen training and indoctrination program before authorization to enter regulated area

“Section 1910.1011—4-Aminodiphenyl: (e)(5) carcinogen training and indoctrination program before authorization to enter regulated area

“Section 1910.1012—Ethyleneimine: (e)(5) carcinogen training and indoctrination before authorization to enter regulated area

“Section 1910.1013—beta-Propiolactone: (e)(5) carcinogen training and indoctrination program before authorization to enter regulated area

“Section 1910.1014—2-Acetylaminofluorene: (e)(5) carcinogen training and indoctrination program before authorization to enter regulated area

“Section 1910.1015—4-Dimethylaminoazobenzene: (e)(5) carcinogen training and indoctrination before authorization to enter regulated area

“Section 1910.1016—N-Nitrosodimethylamine: (e)(5) carcinogen training and indoctrination program before authorization to enter regulated area

“Section 1910.1017—Vinyl Chloride: (j)(1) (i-ix) each employee engaged in vinyl chloride or polyvinyl chloride operations shall be provided training in a program relating to the hazards of vinyl chloride and precautions for its safe use

“Section 1910.94—Open-Surface Tanks: (d)(9)(i) personal protection and first aid; (vi) users of respirators

“(10) (v) during tank cleaning requiring respiratory protection, at least one trained rescuer in safe area

“Section 1910.96—Ionizing Radiation: (f) Evacuation Signal—(3) (viii) familiarity with actual sound of warning alarm

“Section 1910.106—Flammable and Combustible Liquid Storage Tanks: (b)(5)(vi)(v)(3) loca-

tion and operation of valves in flood emergency
“Section 1910.109—Explosives and Blasting Agents: (d)(3)(i and iii) drivers of transportation vehicles

“(g)(3)(iii)(a) drivers of bulk delivery and mixing vehicles

“(g)(6)(ii) drivers of vehicles carrying blasting agents

“(h)(4)(ii)(b) drivers of water gel bulk delivery and mixing vehicles

“Section 1910.111—Storage and Handling of Anhydrous Ammonia: (a)(13)(ii) tank car unloading

“Section 1910.134—Respiratory Protection: (a)(3) instructions and training in use

“(b)(1 & 3) written procedures in selection and use; and training in use and limitations

“(e)(2) instruction of individual who issues respirators; (3) personnel familiar with written procedures for respirator needs in normal and emergency situations; (5) instruction of supervisors and workers in selection, use, and maintenance—including handling the unit, proper fitting, testing the seal, wearing in normal air and then in test atmosphere; (i) fitting instructions and practice, and having wearer check facepiece fit each time he uses it by following manufacturer's fitting instructions

“Section 1910.145—Accident Prevention Signs and Tags: (c)(1)(ii) significance of “Danger” signs; (2)(ii) significance of “Caution” signs; (3) safety instruction signs

“Section 1910.151—Medical Services and First Aid: (a) professional medical advice on plant health; (b) first aid training

“Section 1910.161—Carbon Dioxide Fire Extinguishing Systems: (a)(2) evacuation of and no entry into carbon dioxide filled areas

“Section 1910.178—Powered Industrial Trucks: (1) training in safe operation

“Section 1910.179—Overhead and Gantry Cranes: (n)(3)(ix) when two or more cranes to lift one load, instruction in positioning, rigging and movements

“Section 1910.180—Crawler Locomotive and Truck Cranes: (h)(2)(xii) when two or more cranes to lift one load, instruction in positioning, rigging and movements

“Section 1910.217—Mechanical Power Presses: (e)(3) training of press maintenance personnel;

“(f)(2) instruction of press operators in safe work methods

"Section 1910.218—Forging Machines: (a)(2) (iii) training personnel for inspection and maintenance

"Section 1910.252—Welding, Cutting, and Brazing: (b)(1)(iii) instructing arc welding operators in safety operation and maintenance

"(c)(1)(iii) instruction of resistance welding operators; (c)(6) instructions in reporting of resistance welding equipment defects to supervisor

"(d)(2)(xiii)(c) training of cutters or welders and their supervisors in safe operations and processes

"Section 1910.264—Laundry Machinery Operation: (d)(1)(b)(v) instructing employees in job hazards and safe practices

"Section 1910.266—Pulpwood Logging: (c) (5) Chain Saw Operators—instruction in (i) daily inspection of handles, guards, controls, mufflers; (ii) manufacturer's instructions for operation and adjustments; (iii) refueling safety; (iv) two-hand operation; (v) starting saw at least 10 ft. from fueling areas; (vi) starting saw on ground or firmly supported; (vii) footing, and clearing interfering brush; (viii) prohibition against use of fuel for starting fires or as cleaning solvent; (ix) shut off when carrying saw, or at idle only for short safe distances; (x) carrying to prevent contact with chain or muffler; (xi) no overhead cutting or at such distance as to weaken grip

"(c)(6) Stationary and Mobile Equipment Operators—instruction in (i) manufacturer's recommendations for use and maintenance; (ii) absence of flammable materials; (iii) absence of slip and fall hazards; (iv) shutdown for fueling, servicing and repairs; (v) inspections for signs of failure; (vi) checking all around the machine before starting; (vii) operation only from operator's station or as manufacturer recommends; (viii) seat belts on mobile equipment; (ix) checking all controls before starting; (x) grounding or securing of movable parts when not in use; (xi) load capacity and operating speed; (xii) stability limitations of equipment; (xiii) keeping safe distance from other equipment and personnel; (xiv) use of signalman; (xv) not operating booms, loads, etc., over or near personnel; (xvi) signaling intentions to personnel in or near work area; (xvii) dismounting by mobile vehicle operator during loading or unloading of his vehicle; (xviii) minimizing shock loads on wire rope; (xix) prohibition against riders or observers on machines;

(xx) shutdown of engine, applying brake locks and grounding elements before dismounting; (xxi) transportation of equipment on a vehicle.

"(c)(7) Explosives—trained and experienced personnel

"(e)(1) Felling Operations—instructions in (iii) approaching a feller (distance and signal); (v) prohibition against work under a lodged tree; (2) manual felling—(i) making a clear path before starting cut; (ii) appraisal of tree condition, wind, other trees, and other hazards before starting cut

"(e)(6) Skidding and Prehauling—(viii) instruction of operators in avoiding hitting overhead obstructions

"(e)(9) Off-Highway Truck Transport—operator instruction to check load security and binders just before or just after entering public road.

"Section 1910.268—Telecommunications Center: (b)(2) Battery room instruction in routine and emergency procedures.

"Section 1910.268—Telecommunications: (c) Pre-work training in precautions including first aid (with artificial respiration) and, where appropriate, harmful substances, animals and plants, and emergency procedures."

2-5 RECOMMENDED MATERIAL FOR AN OSHA LIBRARY

In order to assist safety and health personnel in meeting and understanding OSHA standards, the publications listed below are recommended for inclusion in an OSHA library. The list is not complete, but should be used to supplement other safety and health publications. Further, these publications provide an excellent reference for OSHA sources of standards. The nearest OSHA office can make copies available, or they may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20404:

"All About OSHA" (2056)

"Occupational Safety and Health Standards," Part 11 — June 27, 1974 *Federal Register*

"Construction Safety and Health Regulations," Part 11 — June 24, 1974 *Federal Register*

"General Industry Guide for Applying Safe-

ty and Health Standards: 29CFR 1910”
(OSHA 2072)
“Compliance Operations Manual” (OSHA
2006)

“The Target Health Hazards Program”
(OSHA 2075)
“Inspections” (OSHA 2026)
Job Safety and Health — Official monthly
magazine of OSHA

CHAPTER 3. RESPIRATORY HAZARDS AND PROTECTION

3-1 INTRODUCTION*

The purpose of this section is to list and briefly describe various categories of respiratory hazards that might be encountered and which may require the use of respirators. The information provides a general background for relating the guidance in subsequent sections to the type of hazard encountered. Management, however, will find it necessary to consult references on industrial hygiene and toxicology, and perhaps expert individuals, to develop the necessary comprehensive information on specific airborne contaminants.

3-2 CLASSIFICATION OF RESPIRATORY HAZARDS AND RESPIRATORS*

Respiratory hazards, for the purpose of this standard, are classified as follows: (ANSI Z88.2-1969)

- (1) oxygen deficiency
- (2) gas and vapor contaminants
 - (a) immediately dangerous to life or health
 - (b) not immediately dangerous to life or health
- (3) particulate contaminants (dust, fog, fume, mist, smoke, and spray)
 - (a) immediately dangerous to life or health
 - (b) not immediately dangerous to life or health
- (4) combination of gas, vapor, and particulate contaminants
 - (a) immediately dangerous to life or health
 - (b) not immediately dangerous to life or health

Respirators may afford some protection against high temperature atmospheres. Further information on the hazards of and use of respirators in high temperatures is presented in a National Fire Protection Association publication, *Breathing Apparatus for The Fire Service*, published in 1966.

The basic respiratory hazards are classified in table 3-1 according to expected biological ef-

fects of the contaminants. Many respirators, particularly air-purifying respirators, are designed and selected on the basis of chemical and physical properties of the air contaminants.

Particle size distribution and solubility are important parameters for particulate contaminants. Particles smaller than 5 micrometers in aerodynamic diameter more readily reach the lungs and are more readily dissolved and absorbed into the bloodstream or deposited on lung tissue. The solubility of the material usually determines whether the resulting toxic effect, if any, is in the lungs or other organs. Particles larger than 5 micrometers in aerodynamic diameter are generally trapped in the upper respiratory tract, cleared, and swallowed with possible subsequent absorption from the gastrointestinal tract, depending on their solubility.

Respirators fall into the following classifications, according to mode of operation:

- (1) atmosphere-supplying respirators
 - (a) self-contained
 - (b) hose-mask
 - (c) air-line
 - (d) combination self-contained and hose-mask or air-line
- (2) air-purifying respirators
 - (a) gas and vapor (gas-mask and chemical cartridge)
 - (b) particulate (dust, fog, fume, mist, smoke, and sprays)
 - (c) combination gas, vapor, and particulate
- (3) combination atmosphere-supplying and air-purifying respirators

3-3 DETECTION OF RESPIRATORY HAZARDS

To determine the type and severity of the hazard, detection devices are available for specific hazards. Some of these devices are listed below.

For evaluation of hazards not covered by the devices listed below, or for a determination of the degree of occupational respiratory hazard presented in a specific situation, assistance may be obtained through local AMEDD representatives such as MEDDAC/MEDCEN health and environmental personnel, or the U.S. Army Environmental Hygiene Agency.

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Table 3-1. Classification of respiratory hazards according to their biological effect (ANSI Z88.2-1969)*

Oxygen Deficiency	Gas and Vapor Contaminants	Particulate Contaminants (Dust, fog, fume, mist, smoke, and sprays)
<p>Occurrence: Confined or unventilated cellars, wells, mines, ship holds, tanks, burning buildings, and enclosures containing inert atmospheres. (See note 1.)</p> <p>Atmospheric O₂ content (percent by volume) versus expected conditions:</p> <p>20.9 percent: Oxygen content of normal air.</p> <p>16 percent: Flame of safety lamp or ordinary combustibles extinguished, and symptoms of anoxia begin to appear in humans.</p>	<p>Asphyxiants: Interfere with utilization of O₂ in the body.</p> <p>Simple asphyxiants: Physiologically inert substances that dilute O₂ in the air (for example, nitrogen, hydrogen, helium, methane). See Oxygen Deficiency, Column 1.</p> <p>Chemical asphyxiants: Low concentrations interfere with supply or utilization of O₂ in the body (for example, carbon monoxide, hydrogen cyanide, cyanogen and nitriles).</p> <p>Irritants: Corrosive in action. May cause irritation and inflammation of parts of the respiratory system (also skin and eyes) and pulmonary edema (for example, ammonia, hydrogen chloride, formaldehyde, sulfur dioxide, chlorine, ozone, nitrogen dioxide, phosgene, and arsenic trichloride).</p> <p>Anesthetics: Cause loss of feeling and sensation with unconsciousness and death possible (for example, nitrous oxide, hydrocarbons, and others). Some anesthetics injure body organs; for example, carbon tetrachloride (liver and kidneys), chloroform (liver and heart), benzene (bone marrow), and carbon disulfide (nervous system).</p> <p>Systemic poisons: Damage organs and systems in the body; for example, mercury (nervous system and various organs), phosphorous (bone), hydrogen sulfide (respiratory paralysis), and arsine (red blood cells and liver).</p>	<p>Relatively inert: May cause discomfort and minor irritation, but generally without injury at reasonable concentrations (for example, marble, gypsum).</p> <p>Pulmonary fibrosis-producing: Produce nodulation and fibrosis in the lung, possibly leading to complications (for example, quartz, cristobalite, tridymite, asbestos).</p> <p>Cancer-producing: Produce cancer in some individuals after "latent" period of 20-40 years (for example, asbestos, chromates, radioactive particulates).</p> <p>Chemical irritants: Produce irritation, inflammation, ulceration, and so forth, in upper respiratory tract (for example, acid mists, alkalis).</p> <p>Systemic poisons: Produce pathologic reactions in various systems of the body (for example, lead, manganese, cadmium).</p> <p>Allergy-producing: Produce reactions such as itching, sneezing, and asthma (for example, pollens, isocyanates, gums, spices).</p> <p>Febrile reaction-producing: Produce chills followed by fever (for example, fumes of zinc and copper).</p>

Combinations of Gas, Vapor, and Particulate Contaminants

Combinations of contaminants may occur simultaneously in the atmosphere. Contaminants may be entirely different substances (dusts and gases from blasting) or the particulate and vapor forms of the same substance. Synergistic effects (joint action of two or more agents that results in an effect which is greater than the sum of their individual effects) may occur. Such effects may require extraordinary protective measures.

NOTE 1: The adverse effects of oxygen deficiency increase with decreasing atmospheric pressure or increased altitude.

NOTE 2: Conditions *Immediately Dangerous to Life or Health* may result from most of the above hazards with the probable exception of nuisance or low-toxicity dusts. Such conditions constitute atmospheres that would rapidly lead to death or to injury that would eventually impair health. For example, a 10-minute exposure to 120 parts per million (ppm) of phosgene may be fatal, and exposure to very high concentrations of a radioactive material such as plutonium 239 could present a danger to health from delayed effects of radiation damage to body tissues.

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Equipment necessary to adequately evaluate occupational respiratory hazards must be certified by NIOSH and frequently calibrated to maintain accuracy, where appropriate, and shall be used only by personnel trained to conduct such evaluations.

See section 3-10 for NIOSH certification standards.

3-3.1 ATMOSPHERES DEFICIENT IN OXYGEN

An oxygen-deficient atmosphere is one which contains less than 19.5 percent oxygen by volume at sea level. Uncontaminated atmospheres containing 19.5 percent or more oxygen are considered respirable.

A. INDICATOR, OXYGEN DEFICIENCY (fig. 3-1)

Portable direct-reading device for indicating the oxygen in the atmosphere over a range of 0-25 percent (5-40 percent range available).

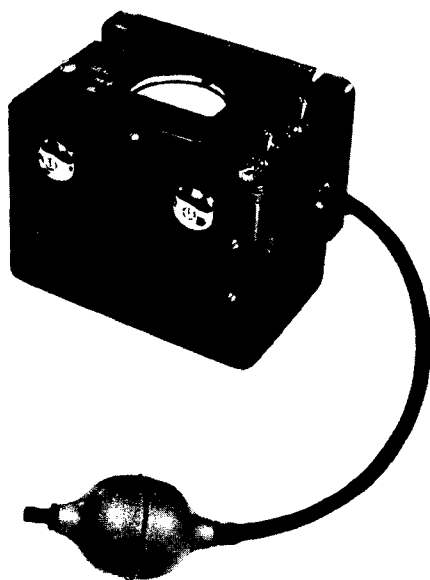


Figure 3-1. Indicator, Oxygen Deficiency.

Source: LIN 53200N

Use: Determination of oxygen content of atmospheres suspected of being deficient in, or containing, surplus oxygen.

3-3.2 ATMOSPHERES CONTAMINATED WITH IRRITABLE OR POISONOUS SUBSTANCES

3-3.2.1 GASEOUS AND VAPOR CONTAMINANTS

Gaseous contaminants may be toxic or inert. Toxic gases and vapors adversely affect the physiologic processes in the body, and, depending on the particular contaminant, its concentration and the length of exposure may cause serious illness or death. Inert gases are harmful primarily due to displacement of oxygen. Gaseous contaminants immediately dangerous to life are gases or vapors present in sufficient concentration to endanger the life of a person breathing them for even a short time. Gases or vapors not immediately dangerous to life may be breathed for a short period of time; however, prolonged exposure or repeated short exposures may produce harmful effects.

A. DETECTOR KIT, CARBON MONOXIDE, COLORIMETRIC, M23 (fig. 3-2) AND SIMILAR, LENGTH OF STAIN

A metal carrying case containing a rubber sampling bulb unit, or sampling pump, an indicating tube seal breaker, carbon monoxide colorimetric indicating tubes, a calibration chart, and an instruction sheet. The tubes indicate the presence of carbon monoxide in the air by changing colors, or by the length of stain of an absorber compound. For direct readout or with comparison charts.

Source: LIN G-04163

NSN 665-00-618-1482

Use and Limitation: For detection of carbon monoxide only.

B. DETECTOR KIT, CHEMICAL AGENT, ABC AND M18A2 (fig. 3-3)

A carrier that contains components to perform certain tests to detect AC, CG, CK, ED, G, H, HD, HN, HT, L and HT, L and V agents.

Source: LIN G-04300

M18A2 NSN 6665-00-903-4767

Use: To detect dangerous concentrations of toxic chemical agents in the atmosphere as well as residual surface contamination. If a toxic agent is suspected but cannot be identified, samples can be collected and forwarded to a laboratory for identification.

Limitation: Not designed to indicate when necessary to mask in case of toxic chemical agent attack. If presence of agent is suspected, put on masks before using the kit.

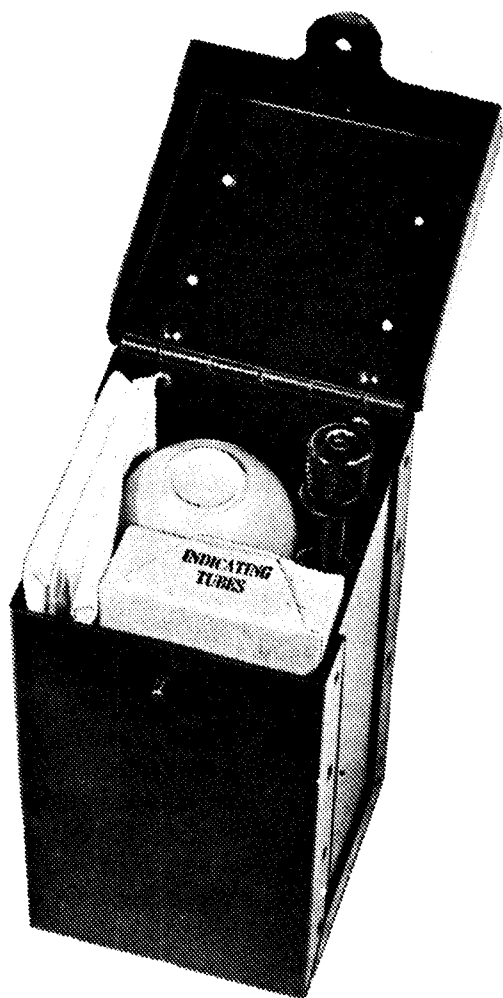


Figure 3-2. Detector Kit,
Carbon Monoxide, Colorimetric, M23.

The effects of mustard and G-agents are cumulative; therefore, always consider prior exposure to mustard and G-agents when determining safe times, as defined in TM 3-6665-254-12.

C. DETECTOR KIT, CHEMICAL AGENT, VGH, AN-M15A2A and AN-M15A2N (fig. 3-4)

A carrier and components to test for CK, CX, G, H, and V agents.

Source: LIN G-04437

AN-M15A2A Kit

NSN 6665-00-903-4765

AN-M15A2N

NSN 6665-00-903-4766



Figure 3-3. Detector Kit,
Chemical Agent: ABC-M18A2.

Use: To detect concentrations of toxic chemical agents immediately dangerous to life.

Limitation: Not designed to indicate when necessary to mask for presence of toxic chemical agent. If presence of agent is suspected, put on masks before using the kits.

The effects of mustard and G-agents are cumulative; therefore, always consider prior exposure to mustard and G-agents when determining safe times as defined in TM 3-6665-253-12.

D. SAMPLING KIT, CB AGENT M34 (fig. 3-5)

Kit consists of two soil sampling kits, one container for vials, and two pairs of gloves packed in a fiberboard box.

Source: LIN S-29795

NSN 6665-00-776-8817

Use: By trained CB personnel to sample soil, surfaces, and water for CB agent. They can also

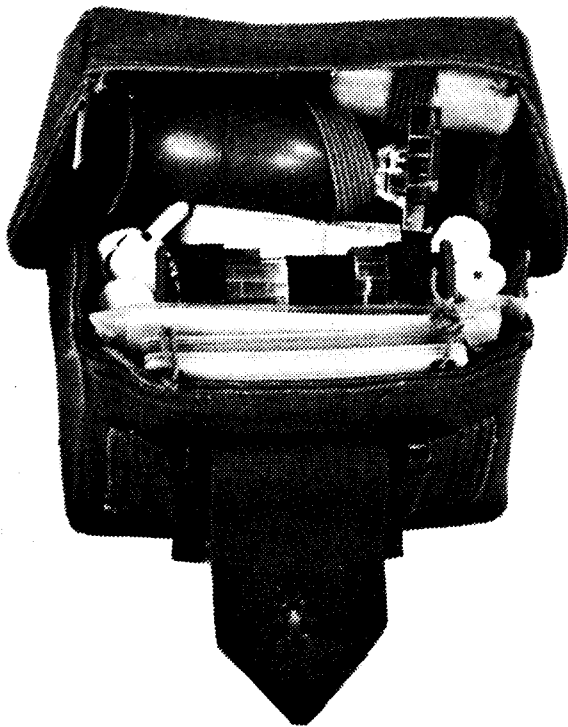


Figure 3-4. Detector Kit, Chemical Agent:
VGH, AN-M15A2A and AN-M15A2N.

be used to perform preliminary processing of soil samples.

Reference: TM 3-6665-268-10 Operators Manual

E. SAMPLING AND ANALYZING KIT, CB AGENT, ABC-M19 (fig. 3-6)

Consists of equipment and materials to sample and identify CB agents.

Source: LIN S-29577
NSN 6665-00-776-8810

Use: Used by trained personnel to detect and identify chemical warfare agents, perform preliminary processing of unidentifiable CB agents, and delineate contaminated areas.

Reference: TM 3-6665-205-10/1

F. ALARM, CHEMICAL AGENT, AUTOMATIC: PORTABLE, M8 AND M10 THROUGH M18 AND ASSOCIATED EQUIPMENT (fig. 3-7)

Source: See TM 750-5-15 for Line Item Number and National Stock Number.



Figure 3-5. Sampling Kit, CB Agent, M34.

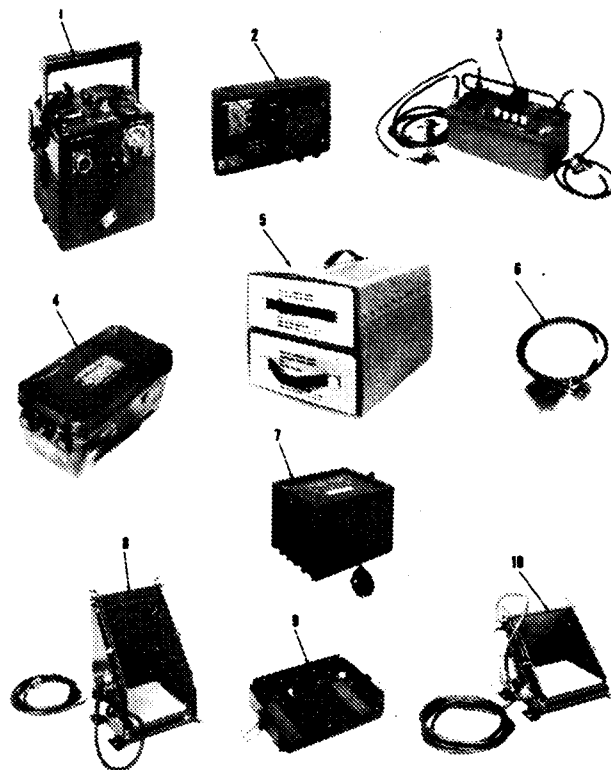


Figure 3-6. Sampling and Analyzing Kit,
CB Agent, ABC-M19.

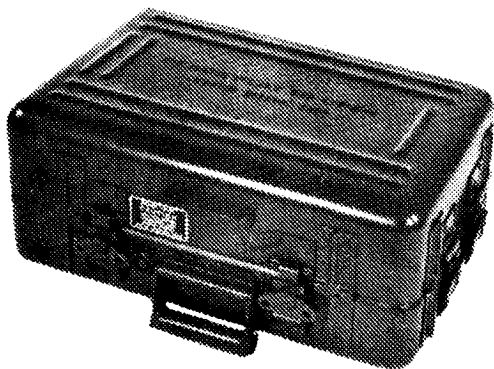


Figure 3-7. Alarm, Chemical Agent, Automatic: Portable, M8 and M10 through M18 and Associated Equipment.

Use: Each alarm system (M8 and M10 through M18) detects very low concentrations of chemical-agent vapors or inhalable aerosols, and automatically signals the presence of chemical agents.

Reference: TM 3-6665-225-12

G. ALARM, G-AGENT, AUTOMATIC, FIXED INSTALLATION, M5 (fig. 3-8)

A chemical feed and reaction section, photometer units and circuits, a continuous-trace re-

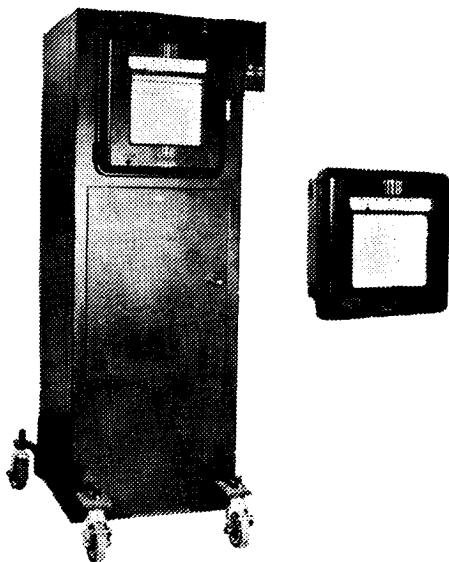


Figure 3-8. Alarm, G-Agent, Automatic, Fixed Installation, M5.

corder, and alarm circuits in a metal cabinet. In the presence of a G-agent, a horn sounds and a red light flashes. The continuous-trace recorder makes a permanent record of operation. Requires a source of 110-volt alternating current.

Source: LIN A32572

NSN 6665-00-561-6218

Use: Provides an automatic alarm system for detecting G-agents in manufacturing plants and other fixed installations.

Reference: TM 3-6665-201-12, -35

H. METER, MERCURY VAPOR

A portable ultraviolet photometer, consisting of a mercury vapor lamp, two phototubes, and an amplifier, contained in a single housing.

Source: Appendix A

Use: To determine mercury vapor concentration in air.

Limitation: This meter has two ranges, 0.005 to 0.1 and 0.03 to 3 milligrams of mercury vapor per cubic meter of air.

I. DETECTOR KIT, MULTIGAS

A kit containing accessories for detecting trichloroethylene, acetone, toluene, and formaldehyde.

Source: LIN 51310N

Use: Per medical activity or installation NOA.

J. DETECTOR KIT, GAS PRECISION

Contains accessories for detecting ammonia, mercury, benzene, chlorine, and other chemicals.

Source: LIN 51300N

Use: Per medical activity or installation NOA.

K. DETECTOR KIT, UNIVERSAL TESTING (fig. 3-9)

A kit containing accessories for detecting over 100 different contaminants, including carbon monoxide, hydrogen sulfide, hydrocyanic acid, aromatic hydrocarbons, sulfur dioxide, etc.

Source: LIN 51302N

Use: By individuals in occupational or preventive medicine programs.

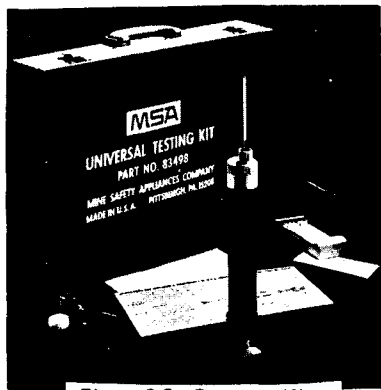


Figure 3-9. Detector Kit,
Universal Testing.

L. ALARM, CARBON MONOXIDE AUTOMATIC

Continuous operating instrument giving a visible and audible warning when carbon monoxide reaches a predetermined concentration setting.

Source: LIN 50095N

Use: In closed area where carbon monoxide fumes create a hazard.

M. INDICATOR, COMBUSTIBLE GAS

A portable, direct-reading device for detecting the presence of combustible gas in a confined space over a range up to and including lower combustible limits of several combustible gases.

Source: LIN 51900N

Appendix A

Use: By safety officers, qualified maintenance personnel, and gas inspectors for indicating the presence or leakage of combustible gas, particularly prior to entry into confined spaces.

Limitation: Should not be totally immersed in the confined test atmosphere or in potential or suspected highly explosive atmospheres due to potential explosion hazard.

3-3.2.2 PARTICULATE CONTAMINANTS

Solid particles (dusts and fumes), liquids (mists and fogs), and combinations of solids and liquids comprise the particulate contaminants. The majority of particulate contaminants are not immediately dangerous to life

but are harmful when exposure extends over a relatively long time. Particulate contaminants are classified according to the physiological effects that they produce:

- (1) Toxic - Contaminant produced injurious effects by other than physical means. Effects are usually caused by adverse chemical reactions.
- (2) Fibrosis-producing dusts, asbestos and fine silica or other pneumoconiosis-producing dusts that remain in the lungs and may cause pulmonary impairment.
- (3) Nuisance-dusts, nontoxic, nonfibrosis particles that produce either local or systemic effects, and may lead to bronchial trouble, pneumonia, or other types of lung disease.

A. AIR SAMPLING PUMP

A 110-volt AC pump with a capacity of 36 liters per minute with flowmeter and filter holder.

Source: LIN 55990N

Use: To sample particulate contaminants in air, by individual in occupational or preventive medicine program; radiological control team.

B. AIR SAMPLER, 110-VOLT AC AND 24-VOLT DC BATTERY OPERATED

A portable unit comprising motor driven pump, flowmeter, and 4-inch diameter filter holder and 24-volt DC battery operated.

Source: LIN 50075N 110-volt AC

LIN 50080N 24-volt DC

Use: To sample particulate matter in air by means of filter paper, by individual in occupational or preventive medicine program; radiological control team.

C. SAMPLER, AIR, DUST AND FUME, ELECTROSTATIC (fig. 3-10)

A portable air sampler requiring 110-volt AC.

Source: Appendix A

Use: Used in preventive medicine program to sample particulate contaminants in air.

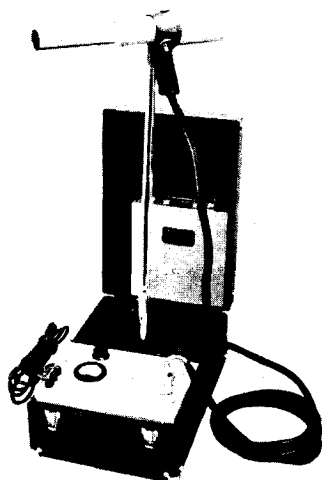


Figure 3-10. Portable Air Sampler.

D. DUST COUNTING AND PARTICLE SIZING EQUIPMENT

Consists of monocular optical microscope, condenser and iris, and other accessory equipment.

Source: Appendix A

Use: Used in preventive medicine to determine particulate contaminant size and concentration.

E. SAMPLER, DUST, HAND-OPERATED: PUMP TYPE WITH NINE ALL-GLASS IMPINGER FLASKS (fig. 3-11)

A lightweight, portable pump for taking dust samples in the field, complete with carrying case and calibrated sampling tubes.

Source: LIN 56970N

Use: For collecting samples of dust and other particulate matter in contaminated atmospheres for subsequent analysis and investigation.

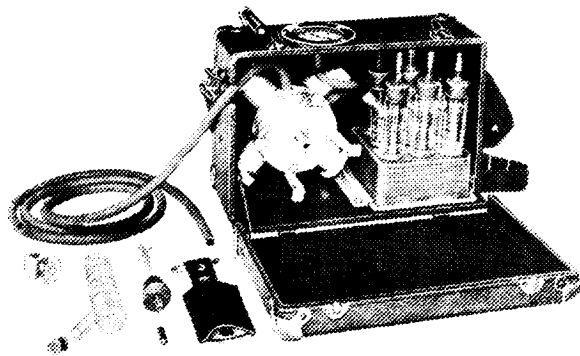


Figure 3-11. Portable Field Pump.

3-4 SELECTION OF RESPIRATORS

NOTE: Where airborne contamination presents a hazard, engineering or administrative controls must first be determined and implemented whenever feasible. Respiratory protection may be used if it is not feasible to implement these types of controls. Whenever possible an evaluation of each operation should be made by trained occupational health service personnel prior to the selection of a respiratory protective device.

ANSI Z88.2-1969*

a. APPROVED OR ACCEPTED RESPIRATORS

Whenever possible, approved or accepted respirators shall be used.

b. GENERAL CONSIDERATIONS

The multiplicity of hazards that may exist in a given operation requires careful and intelligent respirator selection. This selection is made even more complex by the many types of respirators available. Each type has its limitations, areas of application, and operational and maintenance requirements.

The selection of a proper respirator for any given situation requires consideration of the following factors: (1) nature of the hazard; (2) extent of the hazard; (3) work requirements and conditions; and (4) characteristics and limitations of available respirators.

Table 3-2 is a quick reference guide for the selection of respiratory protection appropriate to the type and degree of hazard. The table provides minimal guidance, however, and shall be used along with other information, such as directions provided by respirator manufacturers.

When there is doubt about the concentration of oxygen or hazardous material present in the atmosphere, only those respirators listed as suitable for respiratory protection against oxygen deficiency shall be used. Any erring in the selection of respirators shall be on the safe side.

c. NATURE OF THE HAZARD

The chemical and physical properties, toxicity, and concentration of the hazardous material shall be considered in respirator selection.

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**Table 3-2. Guide for selection of respirators
ANSI Z88.2-1969***

Hazard	Respirator
Oxygen Deficiency	Self-contained breathing apparatus. Hose mask with blower. Combination air-line respirator with auxiliary self-contained air supply or an air-storage receiver with alarm.
Gas and Vapor Contaminants Immediately dangerous to life or health.	Self-contained breathing apparatus. Hose mask with blower. Air-purifying, full facepiece respirator with chemical canister (gas mask). Self-rescue mouthpiece respirator (for escape only). Combination air-line respirator with auxiliary self-contained air supply or an air-storage receiver with alarm.
Not immediately dangerous to life or health.	Air-line respirator. Hose mask without blower. Air-purifying, half-mask or mouthpiece respirator with chemical cartridge.
Particulate Contaminants Immediately dangerous to life or health.	Self-contained breathing apparatus. Hose mask with blower. Air-purifying, full facepiece respirator with appropriate filter. Self-rescue mouthpiece respirator (for escape only). Combination air-line respirator with auxiliary self-contained air supply or an air-storage receiver with alarm.
Not immediately dangerous to life or health.	Air-purifying, half-mask or mouthpiece respirator with filter pad or cartridge. Air-line respirator. Air-line abrasive-blasting respirator. Hose mask without blower.
Combination gas, vapor, and particulate contaminants Immediately dangerous to life or health.	Self-contained breathing apparatus. Hose mask with blower. Air-purifying, full facepiece respirator with chemical canister and appropriate filter (gas mask with filter). Self-rescue mouthpiece respirator (for escape only). Combination air-line respirator with auxiliary self-contained air supply or an air-storage receiver with alarm.
Not immediately dangerous to life or health.	Air-line respirator. Hose mask without blower. Air-purifying, half-mask or mouthpiece respirator with chemical cartridge and appropriate filter.

NOTE: Requisitioners should be thoroughly aware of the capabilities and limitations of the type gas or protective mask required. Applicable TM of 3-4240- series should be referred to and local medical or safety officer consulted if proper mask is not known. For additional information refer to TB MED 223.

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3-4.1 USE OF RESPIRATORS

ANSI Z88.2-1969*

a. OPERATING PROCEDURES

Standard procedures shall be developed for respirator use. These should include all information and guidance necessary for their proper selection, use, and care. Possible emergency and routine uses of respirators should be anticipated and planned for.

b. ISSUANCE OF RESPIRATORS

The correct respirator shall be specified for each job. The respirator type is usually specified in the work procedures by a qualified individual supervising the respiratory protective program. The individual issuing them shall be adequately instructed to insure that the correct respirator is issued. Each respirator permanently assigned to an individual should be durably marked to indicate to whom it was assigned. This mark shall not affect the respirator performance in any way. The date of issuance should be recorded.

c. USE IN DANGEROUS ATMOSPHERES

Written procedures shall be prepared covering safe use of respirators in dangerous atmospheres that might be encountered in normal operations or in emergencies. Personnel shall be familiar with these procedures and the available respirators.

In areas where the wearer, with failure of the respirator, could be overcome by a toxic or oxygen-deficient atmosphere, at least one additional man shall be present. Communications (visual, voice, or signal line) shall be maintained between both or all individuals present. Planning shall be such that one individual will be unaffected by any likely incident and have the proper rescue equipment to be able to assist the other(s) in case of emergency. See table 3-2 for guidance on selection of respirators for use in dangerous atmospheres.

d. AIR LINE COUPLINGS

OSHA 1910.134 (d) — Air line couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of air line respirators with nonrespirable gases or oxygen.

NOTE: All respirators purchased after 31 Mar 75 should be NIOSH or MESA approved to

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comply with OSHA, except when not applicable in unique military situations where such respirators are not available or applicable. See section 3-10.

3-4.2 IDENTIFICATION OF GAS MASK CANISTERS (OSHA 1910.134g)

“(g) *Identification of gas mask canisters.*

(1) The primary means of identifying a gas mask canister shall be by means of properly worded labels. The secondary means of identifying a gas mask canister shall be by a color code.

“(2) All who issue or use gas masks falling within the scope of this section shall see that all gas mask canisters purchased or used by them are properly labeled and colored in accordance with these requirements before they are placed in service and that the labels and colors are properly maintained at all times thereafter until the canisters have completely served their purpose.

“(3) On each canister shall appear in bold letters the following:

“(i)—

Canister for _____
(Name for atmospheric contaminant)
or

Type N Gas Mask Canister

“(ii) In addition, essentially the following wording shall appear beneath the appropriate phrase on the canister label: ‘For respiratory protection in atmospheres containing not more than _____ percent by volume of _____’

(Name of atmospheric contaminant)

“(iii) All of the markings specified above should be placed on the most conspicuous surface or surfaces of the canister.

“(4) Canisters having a special high-efficiency filter for protection against radionuclides and other highly toxic particulates shall be labeled with a statement of the type and degree of protection afforded by the filter. The label shall be affixed to the neck end of, or to the gray stripe which is around and near the top of, the canister. The degree of protection shall be marked as the percent of penetration of the canister by a 0.3-micron-diameter dioctyl phthalate (DOP) smoke at a flow rate of 85 liters per minute.

“(5) Each canister shall have a label warning that gas masks should be used only in atmospheres containing sufficient oxygen to support life (at least 16 percent by volume), since gas

mask canisters are only designed to neutralize or remove contaminants from the air.

“(6) Each gas mask canister shall be painted a distinctive color or combination of colors indicated in Table I-1. All colors used shall be such that they are clearly identifiable by the user and clearly distinguishable from one another. The color coating used shall offer a high degree of resistance to chipping, scaling, peeling, blistering, fading, and the effects of the ordinary atmospheres to which they may be exposed under normal conditions of storage and use. Appropriately colored pressure sensitive tape may be used for the stripes.”

NOTE: *FEDERAL REGISTER* Vol. 37, Number 59, Part II, “Respiratory Protective

Devices,” (par. 11.153) states, in part, that the color and markings of all cartridges shall conform with the color coding and markings for canisters.

3-4.3 SAFETY WARNING

Never use a gas mask without carefully assessing exposure conditions. Use suitable instruments to determine concentration of oxygen and air contaminants, if possible. If in doubt about exposure conditions, use self-contained breathing apparatus only. Always use strictly in accordance with canister labels, gas mask instructions, and limitations. Safety is the responsibility of the user of the mask. DO NOT USE GAS MASKS FOR FIREFIGHTING.

Table I-1

<i>Atmospheric contaminants to be protected against</i>	<i>Colors assigned *</i>
Acid gases.....	White.
Hydrocyanic acid gas.....	White with ½-inch green stripe completely around the canister near the bottom.
Chlorine gas.....	White with ½-inch yellow stripe completely around the canister near the bottom.
Organic vapors.....	Black.
Ammonia gas.....	Green.
Acid gases and ammonia gas.....	Green with ½-inch white stripe completely around the canister near the bottom.
Carbon monoxide.....	Blue.
Acid gases and organic vapors.....	Yellow.
Hydrocyanic acid gas and chloropicrin vapor.....	Yellow with ½-inch blue stripe completely around the canister near the bottom.
Acid gases, organic vapors, and ammonia gases.	Brown.
Radioactive materials, excepting tritium and noble gases.	Purple (Magenta).
Particulates (dusts, fumes, mists, fogs, or smokes) in combination with any of the above gases or vapors.	Canister color for contaminant, as designated above, with ½-inch gray stripe completely around the canister near the top.
All of the above atmospheric contaminants.....	Red with ½-inch gray stripe completely around the canister near the top.

*Gray shall not be assigned as the main color for a canister designed to remove acids or vapors.

NOTE: Orange shall be used as a complete body, or stripe color to represent gases not included in this table. The user will need to refer to the canister label to determine the degree of protection the canister will afford.

3-5 ATMOSPHERES IMMEDIATELY DANGEROUS TO LIFE

A. BREATHING APPARATUS, SELF-CONTAINED, M15 (fig. 3-12)

(Formerly Breathing Apparatus, Compressed Air). Consists of three major groups: facepiece; hose and regulator; and backpack and harness. Two high-pressure air cylinders supply air to the facepiece through the hose and regulator.

Source: LIN C-19503
NSN 4240-00-049-5435
Appendix A
Bureau of Mines or NIOSH approved (Schedule 13E)

Use: To supply respirable air to handlers of liquid guided missile fuels and oxidizers. Also can be used in any area where there is a deficiency of oxygen or where toxic contaminants exist in the atmosphere.

Limitation: Supplies air for 30 to 45 minutes of continuous use under moderate exertion.

Warning: Start breathing apparatus before entering area where toxic fumes are present. When malfunction occurs during use of equipment, leave the hazardous area before attempting any adjustment or repair. Reference TM 3-4240-224-14&P.

(1) BREATHING APPARATUS, SELF-CONTAINED, PRESSURE DEMAND

Source: Appendix A
Bureau of Mines approved (Schedule 13)

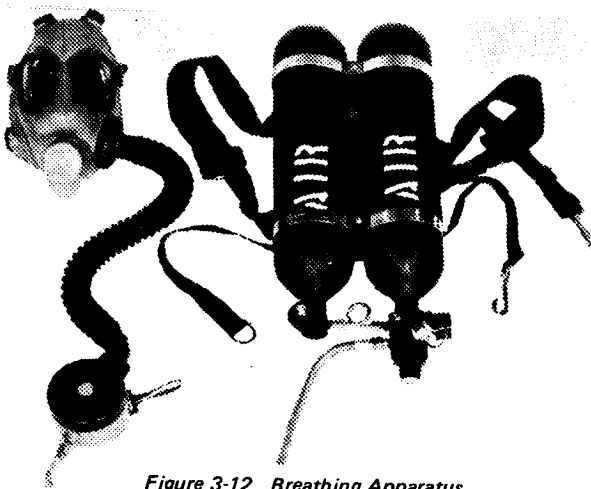


Figure 3-12. Breathing Apparatus, Self-Contained, M15.

Use: Similar to A. above except that a small positive pressure is maintained in the facepiece to prevent inward leakage of contaminated air.

B. ADAPTER, COMPRESSED AIR, BREATHING APPARATUS, M4

Consists of inlet nipple, coupling nipple with coupling nut, and pipe nipple.

Source: LIN A-08728
NSN 4240-00-633-5792

Use: To couple air cylinders to a 15-cfm 3,500 PSI air compressor. Also provides means for sampling compressed air for carbon monoxide during charging operation. As required for issue with LIN C-19503 above.

Reference: TB-CML93

(1) ADAPTER, OXYGEN SUPPLY, CB MASK, AIRCRAFT, ABC-M8

Source: LIN A-11810
NSN 4240-00-848-6074

Use: By operating and maintenance personnel of the OV-1 (Mohawk) airplane to adapt an ABC-M24 mask to the oxygen supply system of the aircraft or to an oxygen bailout bottle.

C. BREATHING APPARATUS, OXYGEN-GENERATING, M20 (fig. 3-13)

Consists of a facepiece, a breathing bag assembly, and a canister. The breathing apparatus removes carbon dioxide and moisture from exhaled breath and generates oxygen to replace oxygen consumed by the user.

Source: LIN C-19640
NSN 4240-00-678-5263
Bureau of Mines approved (Schedule 13E)

Use: Used where there is a deficiency of oxygen in the atmosphere or a high concentration of toxic vapor, gas, dust, or smoke which precludes the use of an air-purifying canister-type mask.

Reference: TM 3-4240-212-14&P

Limitation: The M20 apparatus is not intended for use in place of a field protective mask for CBR protection. The apparatus supplies breathable oxygen to the user for only one hour when he is doing moderately heavy work.

NOTE: Breathing apparatus, self-contained recirculating similar to item C above, except

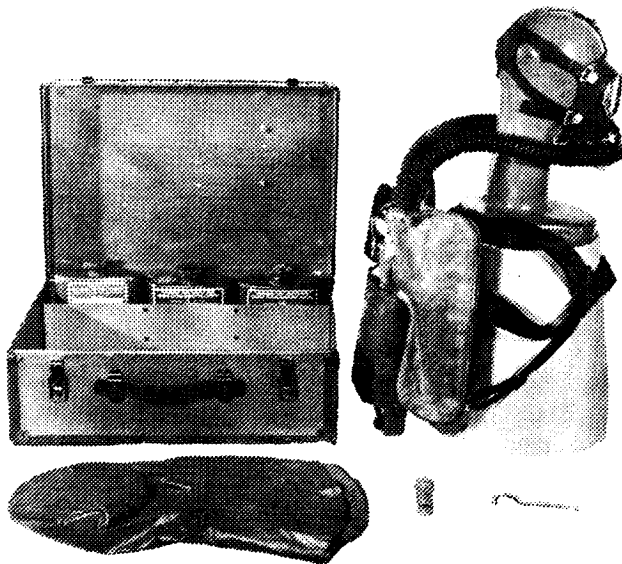


Figure 3-13. Breathing Apparatus, Oxygen-Generating, M20.

compressed oxygen is used. *Source:* Appendix A, Bureau of Mines approved (Schedule 13)

D. BREATHING APPARATUS, SELF-CONTAINED DEMAND TYPE, M23

Consists of a source of air or oxygen, a pressure reducing valve, a demand valve, a facepiece and breathing tube assembly, and a body harness for supporting the air or oxygen container.

Source: LIN C-19777
NSN 4240-00-880-1728
Bureau of Mines approved (Schedule 13E)

Use: Used in atmospheres that are immediately dangerous to life due to oxygen deficiency or high concentration of contaminants.

Limitation: Designed to provide a respirable atmosphere for periods of from 15 minutes to 2 hours, depending on the capacity of the air or oxygen container and the rate at which the wearer breathes.

E. MASK, SCOTT AIR PAK OR EQUIVALENT

Demand type breathing apparatus consisting of a facepiece, hose regulator, backpack, and harness. A high-pressure air cylinder supplies air to the facepiece through the hose and regulator.

Source: Appendix A
Bureau of Mines approved (Schedule 13E)

Use: See item A. above.

Limitation: Supplies air for 1/2 hour of continuous use under moderate exertion.

F. MASK, GAS, ACID AND ORGANIC VAPOR, M10 (fig. 3-14)

Unit includes facepiece assembly, filtering canister, and a canister carrier.

Source: LIN M-12580
NSN 4240-00-268-9735
Bureau of Mines approved (Schedule 14F)

Use: Protects against gases and vapors, such as chlorine, hydrogen cyanide, carbon tetrachloride, and phosgene in concentrations not exceeding 2 percent.

Limitation: Not for use against ammonia fumes and carbon monoxide, or where oxygen deficiencies may be found.

Reference: TM 3-4240-230-12

NOTE: Replacement cannisters are not available in the Federal Supply System. Several replacement cannisters are supplied at the time of purchase.



Figure 3-14. Mask, Gas, Acid and Organic Vapors, M10.

G. MASK, GAS, ALL-PURPOSE, M11A1 (fig. 3-15)

Unit includes a facepiece assembly, a filtering canister, and a canister carrier.

Source: LIN M-12717

NSN 4240-00-540-2404

Bureau of Mines approved (Schedule 14F)

Use: Protection against poisonous gases, smoke and fumes, including carbon monoxide.

Limitation: Not for use against chemical warfare agents. Must not be used in confined spaces where oxygen deficiencies may be found.

Reference: TM 3-4240-231-12

NOTE: Replacement cannisters are not available in the Federal Supply System. Several replacement cannisters are supplied at the time of purchase.



Figure 3-15. Mask, Gas, All-purpose, M11A1.

H. MASK, GAS, AMMONIA, M12 (fig. 3-16)

Unit includes facepiece assembly, a filtering canister, and a canister carrier.

Source: LIN M-12854

NSN 4240-00-268-9736

Bureau of Mines approved (Schedule 14F)

Use and Limitation: Provides protection against ammonia vapors only in concentrations not exceeding 3 percent. Not for use where oxygen deficiencies may be found.

Reference: TM 3-4240-232-12

NOTE: Replacement cannisters are not available in the Federal Supply System. Several replacement cannisters are supplied at the time of purchase.



Figure 3-16. Mask, Gas, Ammonia, M12.

I. MASK, HOSE, WITH BLOWER

Consists of full facepiece and breathing tube, body harness, 1-inch nonkinking hose, and motor-driven or hand-operated blower in case.

Source: Appendix A

Bureau of Mines approved (Schedule 19B-62)

Use: Provides respiratory protection for unlimited periods in atmospheres immediately dangerous to life due to oxygen deficiency or high concentration of contaminants.

Limitation: Blower must be in respirable air and attended by an operator at all times. Travel limited to within 50 feet of blower.

J. MASK, CHEMICAL-BIOLOGICAL: AIRCRAFT, ABC-M24 (fig. 3-17)

Consists of a facepiece group with either an integral or connected system for filtering toxic chemical agents from inspired air. This single-lens facepiece may be worn by both pilots and crewmen in flight and on the ground. When required, may be connected to the aircraft oxygen system or to an oxygen bail-out bottle.

Source: LIN M-11621
NSN 4240-00-776-4384 Medium
NSN 4240-00-808-8798 Large
NSN 4240-00-808-8799 Small
Bureau of Mines approved (Schedule 14F)

Use: Provides protection against toxic chemical agents. Used by aircraft pilots and crewmen to provide respiratory protection against chemical and biological agents in flight and on the ground.

Limitation: Will not protect against carbon monoxide or ammonia gas, or where oxygen content is too low to sustain life.

Reference: TM 3-4240-219-14

(1) HOOD, CB MASK: AIRCRAFT, ABC-M17

The ABC-M17 aircraft CB hood is made of butyl-rubber-coated nylon cloth and is equipped

with two underarm straps with tabs and fastenings. A neck cord with slide fastener holds the hood close to the neck. The opening in the front fits around the rubber eyelens frame.

Source: NSN 4240-00-021-8695 (CTA50-970)

Use: With the M24 aircraft CB mask to provide added head and neck protection against vapors, aerosols, and droplets of CW and BW agents.

Reference: TM 3-4240-219-14

K. MASK, PROTECTIVE TANK, M25A1 (fig. 3-18)

Consists of a facepiece group with either an integral group or connected system for filtering toxic chemical agents from inspired air. This facepiece has a single lens and may be connected with a tank-gas-particulate filter unit for protection in a combat vehicle or, when dismounted, may be worn with a canister. Differences in models concern the microphone and intercommunication system in various vehicles.

Source:

LIN M-10936
NSN 4240-00-994-8750 Medium
NSN 4240-00-994-8751 Small
NSN 4240-00-994-8752 Large

Use: Provides protection against toxic chemical agents.

Limitation: Same as Mask, Chemical-Biological, Aircraft.

Reference: M14A2 TM 3-4240-223-14
M25A1 TM 3-4240-255-14

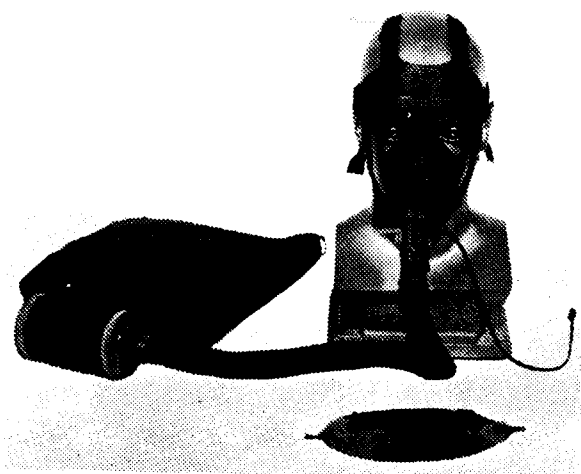


Figure 3-17. Mask, Chemical-Biological: Aircraft, ABC-M24.



Figure 3-18. Mask, Chemical-Biological: Tank, M25A1.

L. HOOD, MASK TANK PROTECTIVE, ABC M5

A lightweight butyl-rubber hood to be used with the M14A2 Tank Mask.

Source: LIN K-44713

NSN 4240-00-860-8987

Use: To protect head, neck, and shoulders from vapors, aerosols, and droplets of toxic chemical agents. Used with mask M25A1.

Reference: TM 3-4240-223-14

M. MASK, CHEMICAL-BIOLOGICAL: FIELD, ABC M17, and ABC M17A1 (fig. 3-19)

Consists of a facepiece group with either an integral or connector system for filtering toxic agents from inspired air. Has dual lenses with the filter system mounted on or within the facepiece.

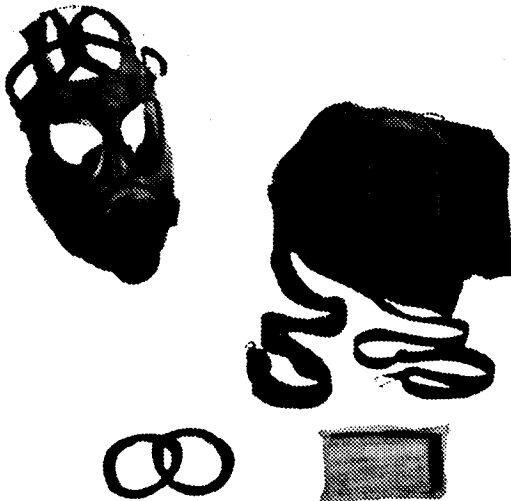


Figure 3-19. Mask, Chemical-Biological: Field, ABC-M17.

Source: LIN M-11895

ABC M17

NSN 4240-00-542-4450
through 4452

ABC M17A1

NSN 4240-00-926-4199
through 4200

Resuscitation Tube, CB Mask: M1

LIN R-88578

NSN 4240-00-930-2078

NOTE: The M17A1 differs from ABC M17 by inclusion of a water drinking and resuscitation device.

Use: Provides protection against toxic chemical agents.

Limitation: The ABC - M17 mask is used to protect the face, eyes, and respiratory tract of the wearer from field concentrations of chemical and biological (CB) agents. This mask does not protect the user against ammonia or carbon monoxide, nor is it effective in confined spaces where the oxygen content of the atmosphere is too low to maintain functional capability (below 18 percent). Refer to TB MED 223 for lists of proper respiratory devices for other than combat. The ABC-M17 Mask is not approved for use in industrial type operations and should not be used where oxygen deficiencies may be expected.

Reference: M17 TM 3-4240-202-14

M17A1 TM 3-4240-201-20P

N. MASK, CHEMICAL-BIOLOGICAL: SPECIAL-PURPOSE, M9 and M9A1 (fig. 3-20)

The only difference between the M9 and M9A1 is their carriers. The canister is attached to facepiece at either the right or left cheek position.

Source: LIN M-11689

M9

Small, right NSN 4240-00-368-6088/
6092 various sizes

M9A1

Small, right NSN 4240-00-368-6093/
6098 various sizes

Bureau of Mines Approved (Schedule 14F)

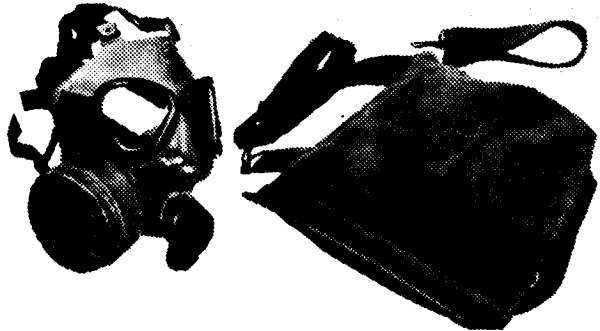


Figure 3-20. Mask, Chemical-Biological: Special-Purpose M9 and M9A1.

Use: The M9 and M9A1 special purpose CB masks are designed to protect the wearer's face, eyes, and respiratory tract against chemical and biological agents.

Limitation: The M9 and M9A1 masks are not approved for use in industrial type operations and should not be used where oxygen deficiencies may be expected.

Reference: TM 3-4240-204-14

O. HOOD, MASK, FIELD PROTECTIVE, M6 and M6A2

A lightweight butyl-rubber hood to be used with the M17 Field Protective Mask.

Source: LIN K-44576

M6 Hood NSN 8415-00-978-9432

M6A2 Hood NSN 4240-00-999-0420

Use: To protect head, neck, and shoulders from vapors, aerosols, and droplets of toxic chemical agents used with mask ABC 14A2, M25, and M25A1.

Reference: TM 3-4240-223-14

P. MASK, CHEMICAL-BIOLOGICAL: HEADWOUND, ABC M18 (fig. 3-21)

A hood-shaped mask made of gas-aerosol filter material with two transparent windows. Inhaled air is drawn into the mask through the filter material; exhaled air and moisture are diffused outward the same way.

Source: LIN M-11484

NSN 4240-00-678-5262

Use: Protects the neck, head, and respiratory tract against chemical and biological agents and radioactive dust and vapors. Designed for use by head wound casualties who cannot wear a regular mask.

Limitation: Will not provide complete protection when headwound combined with a neckwound prevents complete closing of the neck seal.

Reference: TB CML-59

Q. MASK, RIOT CONTROL AGENT: M28 (fig. 3-22)

The major components are the mask and the waterproof pouch-type carrier. The mask is made with a silicone rubber facepiece and flex-



Figure 3-21. Mask, Chemical-Biological: Headwound ABC-M18.

ible plastic lenses. Special filter elements are installed in cheek pouches inside the mask.

Source: LIN M-13265

NSN 4240-00-880-0010 Small

NSN 4240-00-878-8296 Medium

NSN 4240-00-880-0009 Large

Use and Limitation: Designed to protect the face, eyes, and respiratory tract of the wearer against riot control agents only.

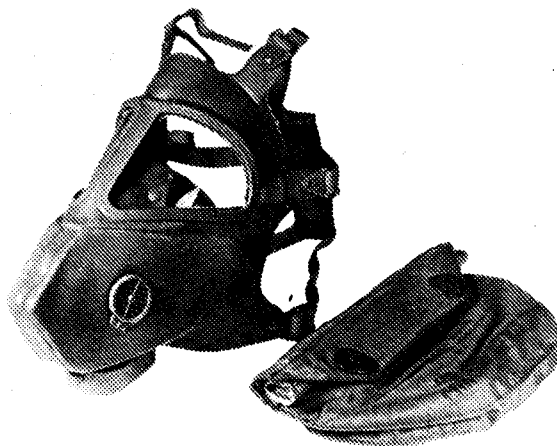


Figure 3-22. Mask, Riot Control Agent: M28.

R. MASK PROTECTIVE CIVILIAN: M22

Source: LIN M-11758
NSN 4240-00-684-6951
through 6956 (sizes 1 to 6)

S. MASK CBR: Noncombat: M16

Source: LIN M-13128
NSN 4240-00-542-4262
through 4265 (sizes 3 to 6)

3-6 ATMOSPHERES NOT IMMEDIATELY DANGEROUS TO LIFE

A. RESPIRATOR, AIR-FILTERING, PAINT-SPRAY (fig. 3-23)

A half-mask facepiece with particulate-removing filters and organic vapor cartridges for protection against paint spray mists and vapors. Supplied with replacement filters and cartridges.

Source: LIN R-87285
NSN 4240-00-022-2524
NIOSH approved (Schedule 23)

Use: To protect the wearer against harmful vapors and aerosols encountered in spray painting.

Limitation: Not for use where oxygen deficiencies may be expected. Replacement cartridges are not available in the Federal Supply System. Interchange of cartridges and filters among different types of respirators is not recommended. Interchange of parts may negate any approvals applied to a given respiratory protective device.

(1) Respirator, Paint-Spray

Source: NSN 4240-00-368-3150

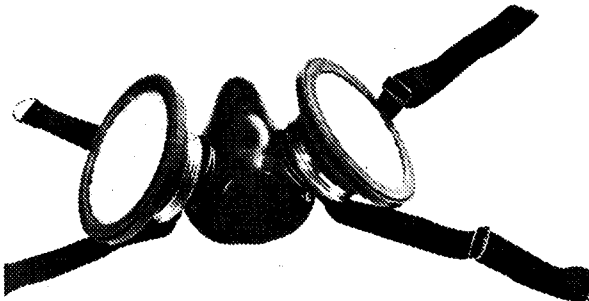


Figure 3-23. Respirator, Air-filtering Paint-Spray.

Use: In paint spray gun, paint spray facility or activity, by paint spray supervisor, TOE 32-57.

B. HELMET, HOOD OR MASK, ABRASIVE BLASTING (fig. 3-24)

A continuous-flow air-line respirator with suitable covering to protect wearer's head and neck from rebounding abrasive material.

Source: LIN 52760N
Bureau of Mines or NIOSH approved (Schedule 19B)

Use: Provide respiratory protection in abrasive blasting operations.

Limitation: Use limited to areas from which the wearer can escape unharmed without the use of the respirator.

Note: Air supplied for breathing purposes must meet breathing air quality standards.



Figure 3-24. Helmet Hood or Mask, Abrasive Blasting

(1) Respirator: Air-Line

Source: LIN R-86874
NSN 4240-00-288-4523

C. HELMET SANDBLASTING: WITH AIR HOSE BELT BREATHING TUBE VALVE

Source: LIN K-34870
NSN 8470-00-161-9414
Bureau of Mines or NIOSH approved (Schedule 19B)

Use: Provide respiratory protection in abrasive blasting operations.

Limitation: Use limited to areas from which the wearer can escape unharmed without the use of the respirator.

NOTE: Air supplied for breathing purposes must meet breathing air quality standards.

D. RESPIRATOR, CONTINUOUS-FLOW AIR-LINE

Consists of either a half-mask or full facepiece, or a helmet or hood covering head and neck, air-flow control device, air-supply hose, and source of respirable air. Pressure regulators, relief valves, and air filters are usually required accessories.

Source: Appendix A
Bureau of Mines or NIOSH approved (Schedule 19B)

Use: Provides respiratory protection against gases, vapors, and particulate contaminants such as paint spray, vapors, and pigments; welding and cutting fumes; fumes from molten metal; toxic dusts and other contaminated atmospheres that are not immediately dangerous to life and from which the wearer can escape unharmed without the respirator.

Limitation: Use limited to areas from which the wearer can escape unharmed without the use of the respirator.

NOTE: Air supplied for breathing purposes must meet breathing air quality standards.

E. RESPIRATOR, DEMAND-FLOW, AIR-LINE (fig. 3-25)

Similar to item D except that flow control device is replaced by a demand regulator, which supplies air to facepiece only when wearer inhales.

Source: Appendix A
Bureau of Mines or NIOSH approved (Schedule 13E)



Figure 3-25.
Respirator, Demand-flow, Airline.

Use: Same as item D. Used when source of respirable air is limited, such as from cylinders or compressed air.

F. RESPIRATOR, LIGHTWEIGHT, CHEMICAL-CARTRIDGE

A half-mask facepiece with a single-cartridge receptacle permitting sideward and downward vision--cartridges are filled with activated charcoal to remove organic vapors from inspired air.

Source: Appendix A
Bureau of Mines or NIOSH approved (Schedule 23B)

Use: Provides respiratory protection in low concentration of organic vapors, such as acetone, alcohols, butyl acetate, benzene, carbon tetrachloride, chloroform, gasoline, kerosene, naphtha, toluene, trichloroethylene, and turpentine.

Limitation: Limited to atmospheres not immediately dangerous to life and health, and not oxygen deficient.

G. RESPIRATOR, CHEMICAL CARTRIDGE (fig. 3-26)

A half-mask facepiece to which is attached one or two chemical cartridges filled with activated charcoal to remove organic vapors from inspired air.



Figure 3-26.
Respirator, Chemical-Cartridge.

Source: NSN 4240-00-069-2684
Fed Spec GGG-M-125, Type 2
NIOSH approved (Schedule 23B)

Limitation: Limited to atmospheres not immediately dangerous to life or health, and not oxygen deficient. Replacement cartridges are not available in the Federal Supply System. Interchange of cartridges among different types of respirators is not recommended. Interchange of parts may negate any approvals applied to the particular device.

H. RESPIRATOR, AEROSOL FILTER, TWIN-CARTRIDGE

A twin-cartridge respirator equipped with special filters for taking out very fine dusts and metal fume particles having a threshold limit value of not less than 0.1 milligram per cubic meter.

Source: Appendix A
Bureau of Mines approved (Schedule 21B)

Use: When equipped with proper filters, for protection against dusts, mists, fumes, smoke,

toxic particles, radioactive aerosols, or finely divided particulates.

Limitation: Must not be worn in oxygen-deficient atmospheres. Should not be used in high concentrations of dusts or fumes or in sand or shot blasting operations.

I. RESPIRATOR, LIGHTWEIGHT, PARTICULATE REMOVING

Half-mask facepiece, single filter pad receptacle permitting sideward and downward vision; it accommodates all-dust filter pad and is provided with extra filters.

Source: NSN 4240-00-084-9394
Fed Spec GGG-M-125, Type III, Class II
NIOSH approved (Schedule 21B)

Limitation: Does not protect against gas and vapor contaminants nor against oxygen deficient atmospheres. Should not be used in high concentrations of dusts or fumes where resistance to inhalation increases rapidly due to blockage of filters (i.e., during abrasive blasting operations). Replacement filters are not available in the Federal Supply System.

J. RESPIRATOR, AIR-FILTERING, PARTICULATE-REMOVING, FOR METAL FUMES

Half-mask facepiece with single or double filter receptacle. Provided with replacement filters.

Source: NSN 4240-00-099-6939
NIOSH approved (Schedule 21)

Limitation: Same as item I except that increased breathing resistance through the respirator limits its use in areas where metal fumes are not generated.

K. RESPIRATORS AND GAS MASKS, PESTICIDES

Half-mask with double or single receptacles for cartridges and filter pads approved for protection against pesticides. Department of Agriculture approvals are accepted by NIOSH as approved respirators.

Source: Appendix A

NIOSH approved (Schedule 23)

Use: Respirators are used during mixing, handling, and application of large quantities of insecticide dusts; during application of space or residual sprays in confined areas; and during preparation of large quantities of spray materials from concentrates.

Limitation: Respirators are not suitable substitutes for local exhaust ventilation in pesticide mixing areas indoors. Storage facilities should be entered using only approved airline or self-contained respiratory protective devices unless it is known that pesticide concentrations do not exceed 100 times the permissible time-weighted average concentration of the most toxic material present for half-mask respirators and 1000 times that concentration for full facepiece respirators or gas masks.

L. REGULATOR FOR SUPPLIED AIR MASK OR RESPIRATOR

Reduces compressed air pressure to the rated value of the air mask or respirator being utilized.

Source: LIN 56580N

M. RESPIRATOR, MOUTHPIECE (fig. 3-27)

Consists of a mouthpiece attached directly to either a respirator body, which holds a replaceable air-purifying cartridge, or to a breathing tube connected to a canister, a nose clamp, and a neck band for belt attachment for carrying respirator on the person.



Figure 3-27.
Respirator, Mouthpiece.

Source: Appendix A

Bureau of Mines and NIOSH approved
(Schedules 14, 21, and 23)

Use: Provides emergency respiratory protection for limited period for escape from an atmosphere suddenly contaminated with hazardous substances.

Limitation: Does not remove gaseous and vapor-radioactive contaminants. Self-contained breathing apparatus should be used in these cases.

N. RESPIRATOR, RADIOACTIVE DUSTS, FUMES, MISTS, FILTER TYPE (fig. 3-28)

These respirators cover the nose, mouth, and eyes to protect against airborne radioactive particulate matter including dusts, fumes, and mists. The filters are designed to remove particulate matter of unusually small sizes.

Source: Appendix A

Use: By nuclear technicians, in operations involving radioactive materials, in civil defense, etc.

Limitation: Does not remove gaseous and vapor radioactive contaminants. Self-contained breathing apparatus should be used in these cases.



Figure 3-28.
Respirator, Radioactive Dusts, Fumes,
Mists, Filter Type.

O. FILTER FOR SUPPLIED AIR MASK OR RESPIRATOR

Mechanical filtration unit for the removal of dusts, mists, fumes, and airborne bacteria. Cartridges are available for removal of gases and vapors.

Source: LIN 52050N

Use: A final filter in compressed air lines used for breathing equipment.

Limitation: Does not remove carbon monoxide.

3-7 MAINTENANCE AND CARE OF RESPIRATORS (ANSI Z88.2-1969)*

3-7.1 GENERAL

A program for maintenance and care of respirators shall be adjusted to the type of plant, working conditions, and hazards involved, and shall include the following basic services:

- (1) inspection for defects (including a leak check)
- (2) cleaning and disinfecting
- (3) repair
- (4) storage

Equipment shall be properly maintained to retain its original effectiveness.

3-7.2 INSPECTION

All respirators shall be inspected routinely before and after each use. A respirator that is not routinely used but is kept ready for emergency use shall be inspected after each use and at least monthly to assure that it is in satisfactory condition.

Self-contained breathing apparatus shall be inspected monthly. Air and oxygen cylinders shall be fully charged according to the manufacturer's instructions. It shall be determined that the regulator and warning devices function properly.

Respirator inspection shall include a check of the tightness of connections and the condition of the facepiece, headbands, valves, connecting tube, and canisters. Rubber or elastomer parts shall be inspected for pliability and signs of deterioration. Stretching and manipulating rubber or elastomer parts with a massaging action

will keep them pliable and flexible and prevent them from taking a set during storage.

A record shall be kept of inspection dates and findings for respirators maintained for emergency use.

3-7.3 CLEANING AND DISINFECTION

Routinely used respirators shall be collected, cleaned, and disinfected as frequently as necessary to insure that proper protection is provided for the wearer. Each worker should be briefed on the cleaning procedure and be assured that he will always receive a clean and disinfected respirator. Such assurances are of greatest significance when respirators are not individually assigned to workers. Respirators maintained for emergency use shall be cleaned and disinfected after each use.

The following procedure is recommended for cleaning and disinfecting respirators:

- (1) Remove any filters, cartridges, or canisters.
- (2) Wash facepiece and breathing tube in cleaner-disinfectant or detergent solution (see following paragraphs). Use a hand brush to facilitate removal of dirt.
- (3) Rinse completely in clean, warm water.
- (4) Air dry in a clean area.
- (5) Clean other respirator parts as recommended by manufacturer.
- (6) Inspect valves, headstraps, and other parts; replace with new parts if defective.
- (7) Insert new filters, cartridges, or canisters; make sure seal is tight.
- (8) Place in plastic bag or container for storage.

Cleaner-disinfectant solutions are available that effectively clean the respirator and contain a bactericidal agent. The bactericidal agent is generally a quaternary ammonium compound. The respirator may be immersed in the solution, rinsed in clean, warm water, and air dried.

Alternatively, respirators may be washed in a liquid detergent solution, then immersed in: (1) a hypochlorite solution (50 parts per million of chlorine) for 2 minutes; (2) an aqueous iodine solution (50 parts per million of iodine) for 2 minutes; or (3) a quaternary ammonium solution (200 parts per million of quaternary ammonium compounds in water with less than 500 parts per million total hardness).

Different concentrations of quaternary

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ammonium salts are required to achieve a disinfecting solution with waters of varying hardness. Also, dermatitis may occur if the quaternary ammonium compounds are not completely rinsed from the respirator. The hypochlorite and iodine solutions are not stable; they age rubber parts, and are corrosive to metallic parts. Therefore, immersion times should not be extended and the disinfectants shall be thoroughly rinsed from the respirator parts.

Strong cleaning and disinfecting agents can damage respirator parts. Temperatures above 185 degrees Fahrenheit and vigorous mechanical agitation should not be used. Solvents which affect elastomer or rubber parts should be used with caution.

Respirators may be contaminated with toxic materials (that is, organic phosphate pesticides and radionuclides). If the contamination is light, normal cleaning procedures should provide satisfactory decontamination; if heavy, a separate decontamination step may be required before cleaning.

For complete decontamination against phosphate pesticides, the respirator should be washed with alkaline soap and rinsed with 50 percent alcohol (ethyl or isopropyl).

Respirators used to protect against radioactive contaminants should be decontaminated to levels not exceeding 100 disintegrations per minute per 100 square centimeters fixed alpha and 0.2 millirad per hour of beta-gamma above background at contact. There should be no detectable removable activity using standard swipe techniques.

3-7.4 Repair

Replacement or repairs shall be done only by experienced persons with parts designed for the respirator. No attempt shall be made to replace components or to make adjustment or repairs beyond the manufacturer's recommendations. Reducing or admission valves or regulators shall be returned to the manufacturer or to a trained technician for adjustment or repair.

3-7.5 Storage

After inspection, cleaning, and necessary repair, respirators shall be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture or damaging chemicals. Respirators placed at stations and work areas for emergency

use should be stored in compartments built for the purpose, be quickly accessible at all times, and be clearly marked. Routinely used respirators, such as dust respirators, may be placed in plastic bags. Respirators should not be stored in such places as lockers or tool boxes unless they are in carrying cases or cartons.

Respirators should be packed or stored so that the facepiece and exhalation valve will rest in a normal position and function will not be impaired by the elastomer setting in an abnormal position.

Instructions for proper storage of emergency respirators, such as gas masks and self-contained breathing apparatus, are found in "use and care" instructions usually mounted inside the carrying case lid.

3-8 SPECIAL PROBLEMS (ANSI Z88.2-1969)*

3-8.1 CORRECTIVE LENS WITH FULL FACEPIECE

Providing respiratory protection for individuals wearing corrective glasses is a serious problem. A proper seal cannot be established if the temple bars of eye glasses extend through the sealing edge of the full facepiece. As a temporary measure, glasses with short temple bars or without temple bars may be taped to the wearer's head. Wearing of contact lenses in contaminated atmospheres with a respirator shall not be allowed.

Systems have been developed for mounting corrective lenses inside full facepieces. When a workman must wear corrective lenses as part of the facepiece, the facepiece and lenses shall be fitted by qualified individuals to provide good vision, comfort, and a gas-tight seal.

3-8.2 EYEWEAR WITH HALF-MASK FACEPIECE

If corrective spectacles or goggles are required, they shall be worn so as not to affect the fit of the facepiece. Proper selection of equipment will minimize or avoid this problem.

3-8.3 RESPIRATOR USE IN LOW TEMPERATURES

Major problems in the use of full facepieces at low temperatures are poor visibility and freezing of exhalation valves. All full facepieces are designed so that the incoming fresh air sweeps

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over the inside of the lens to reduce fogging. Otherwise, it would be impossible to wear a full facepiece in ordinary room temperatures without severe fogging. Antifog compounds can be used to coat the inside of the lens to prevent fogging at room temperatures and down to temperatures approaching 32 degrees Fahrenheit. However, below zero degrees Fahrenheit, antifog compounds will not prevent severe fogging.

Full facepieces are available with nose cups that direct moist exhaled air through the exhalation valve. A properly fitted nose cup should provide satisfactory or adequate visibility at temperatures down to -30 degrees Fahrenheit.

At very low temperatures, the exhalation valve may collect moisture and freeze open, allowing the wearer to breathe contaminated air, or freeze closed, preventing normal exhalation. The Bureau of Mines has published two pamphlets on this subject: *Performance of Open-Circuit Self-Contained Breathing Apparatus at -25° F*, R.I. 7077 (1966), and *Low-Temperature Performance of Compressed-Oxygen Closed-Circuit Breathing Apparatus*, R.I. 7192 (1968). Dry respirable air shall be used with self-contained breathing apparatus or air-line respirators at low temperatures. The dewpoint of the breathing gas shall be appropriate to the ambient temperature.

High-pressure connections on self-contained breathing apparatus may leak because of metal contraction at low temperatures. The connections should not be overtightened since they may break when the temperature returns to normal.

3-8.4 RESPIRATOR USE IN HIGH TEMPERATURES

A man working in areas of high ambient or radiant temperature is under stress. Any additional stress resulting from use of respirators should, therefore, be minimized. This can be done by selecting and using respirators having minimum weight and breathing resistance. Supplied-air respirators and hoods and suits having an adequate supply of cool breathing air are recommended. Further information on use of respirators in high temperatures may be found in *Breathing Apparatus for the Fire Service*, published by the National Fire Protection Association in 1966.

3-8.5 COMMUNICATIONS

Although conventional respirators distort the human voice to some extent, the respirator exhalation valve usually provides a pathway for some speech transmission over short distances in relatively quiet areas. Talking can induce facepiece or component leakage and therefore should be limited while wearing a respirator, especially those with half-mask facepieces.

Mechanical speech transmission devices called speaking diaphragms are available as an integral part of some respirators. These consist of a resonant cavity and diaphragm which amplify sound in the frequency range most important to speech intelligibility. The diaphragm acts as a barrier to the ambient atmosphere. It should be carefully handled and protected by a cover to prevent puncture.

Various methods of electronically transmitting speech from the respirator are available. These utilize a microphone connected to a telephone or radio transmitter. Usually the microphone is mounted in the facepiece, while the amplifier, power pack, and loudspeaker or transmitter are attached to the exterior of the mask, carried on the body, or are remotely located.

Respirators with electric or electronic speech transmission devices having an integral or body-attached battery power supply should be used with caution in explosive atmospheres. Sealed power sources should be checked for integrity of seals. Connecting cables from microphones inside the facepiece shall have gas-tight seals where they emerge from the facepiece. When the loudspeaker diaphragm is part of the barrier between the respirator wearer and the ambient atmosphere, it shall be frequently inspected for leakage and should be adequately protected from puncture or rupture. The assembly of an electronic or electrical speech transmission device into a respirator shall be avoided if it results in a center of gravity and moment of inertia such that the mask may be dislodged from the face during wearer activity in a toxic environment. Removal of speech transmission devices may allow contaminant leakage into the facepiece.

3-8.6 NONCONVENTIONAL RESPIRATORS

Special respirator designs, such as "neck respirators" for persons having a tracheotomy, may

present problems not commonly encountered with conventional respirators. Therefore, the manufacturer should be consulted for special guidance or precautions.

3-8.7 OTHER LIMITATIONS

Respirator filter elements inhibit the normal breathing process by adding a barrier which causes an effective air pressure drop and increases the effort required to ingest a given volume of air. As work load, temperature, and other factors cause the required air volume to increase, the breathing effort also increases, thereby reducing the sustained maximum working capacity of the user. Filter element particles in respirators tend to condense and absorb moisture while not in use and this also increases the breathing effort required.

3-9 RECOMMENDED REQUIREMENTS FOR CODES (Refer to TB MED 223 for Army requirements.) Recommended requirements below are from (ANSI Z88.2-1969).*

3-9.1 PURPOSE

This section includes recommended requirements for authorities considering establishment of respirator regulations or codes. The following recommended requirements are supplemented by recommended practices in subsequent sections of this standard.

3-9.2 PERMISSIBLE PRACTICE

In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, *the primary objective shall be to prevent atmospheric contamination.* This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used pursuant to the following requirements.

3-9.3 EMPLOYER RESPONSIBILITY

Respirators shall be provided by the employ-

er when such equipment is necessary to protect the health of the employee.

The employer shall provide respirators that are applicable and suitable for the purpose intended.

The employer shall be responsible for the establishment and maintenance of a respiratory protective program that shall include the general requirements outlined below.

3-9.4 EMPLOYEE RESPONSIBILITY

The employee shall use the provided respiratory protection in accordance with instructions and training received.

The employee shall guard against damage to the respirator.

The employee shall report any malfunction of the respirator to the responsible person.

3-9.5 MINIMAL ACCEPTABLE PROGRAM

- a. Written standard operating procedures governing the selection and use of respirators shall be established.
- b. Respirators shall be selected on the basis of hazards to which the worker is exposed.
- c. The user shall be instructed and trained in the proper use of respirators and their limitations.
- d. Where practicable, the respirators should be assigned to individual workers for their exclusive use.
- e. Respirators shall be regularly cleaned and disinfected. Those issued for the exclusive use of one worker should be cleaned after each day's use, or more often if necessary. Those used by more than one worker shall be thoroughly cleaned and disinfected after each use.
- f. Respirators shall be stored in a convenient, clean, and sanitary location.
- g. Respirators used routinely shall be inspected during cleaning. Worn or deteriorated parts shall be replaced. Respirators for emergency use such as self-contained devices shall be thoroughly inspected at least once a month and after each use.
- h. Appropriate surveillance of work area conditions and degree of employee exposure or stress shall be maintained.
- i. There shall be regular inspection and evaluation to determine the continued effectiveness of the program.

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3-9.6 PROGRAM ADMINISTRATION

The plant or company industrial hygiene, health physics, safety engineering, or fire department shall administer the program in close liaison with the plant medical department. Responsibility for the program shall be vested in one individual. In small plants having no formal industrial hygiene, health physics, safety, fire, or medical department, the respirator program shall be administered by an upper-level superintendent, foreman, or other qualified individual responsible to the principal manager. The administrator shall have sufficient knowledge of the subject to properly supervise the program.

3-9.7 MEDICAL LIMITATIONS

Persons should not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. The local physician shall determine what health and physical conditions are pertinent. The respirator user's medical status should be reviewed periodically (for instance, annually).

3-10 THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH) NOTICE PROMULGATED IN 1974: RESPIRATORY PROTECTIVE DEVICES

Approval or certification of personal protective devices and industrial hazard measuring instruments, performed today by the National Institute for Occupational Safety and Health, is based on regulations developed for respiratory protective devices by the U.S. Department of the Interior, Bureau of Mines. From 1919 to 1973, the Bureau performed tests and issued approvals on respirators for coal mine use, from its Pittsburgh, Pa., laboratories. On March 25, 1972, in accordance with the Federal Coal Mine Health and Safety Act of 1969, the Bureau and NIOSH issued joint regulations for respirator approval in the *Federal Register* (37 FR 6244). These regulations were amended on March 15,

1973, 38 FR 11458) when the Bureau officially transferred testing of these devices to the NIOSH Testing and Certification Laboratory at Morgantown, West Virginia. Regulations for respirator approval are incorporated in Federal Regulations as Title 30 CFR Part 11. Approvals under these regulations are issued jointly by the Bureau and the Institute.

Respiratory devices approved by the Bureau of Mines under older regulations *and manufactured under a quality control plan approved under Part 11* will be acceptable if purchased before March 31, 1975; but they must be phased out of use according to the following schedule of terminal dates: self-contained breathing apparatus until March 31, 1979; gas masks until March 31, 1977; supplied-air respirators until March 31, 1980; filter-type dust, fume, and mist respirators and chemical-cartridge respirators until March 31, 1976.

3-10.1 BREATHING AIR QUALITY

Breathing air must meet at least the requirements of Grade D breathing air as described in Compressed Gas Association, Commodity Specification G-7.1-1966: oxygen 19-23 percent, hydrocarbons less than 5 mg/m³, carbon monoxide less than 20 ppm, and carbon dioxide less than 1000 ppm. Compressors must be constructed and situated so as to avoid entry of contaminated air into the system. Suitable in-line air-purifying sorbent beds and filters must be installed and maintained to further assure breathing air quality. A receiver of sufficient capability to enable the respirator wearer to escape from a contaminated atmosphere in the event of a compressor failure, and alarms to indicate compressor failure and/or overheating, must be installed in the system. If an oil-lubricated compressor is used, it must have a high-temperature or carbon monoxide alarm, or both. If only a high-temperature alarm is used, the air from the compressor should be tested for carbon monoxide at least monthly, or more frequently as indicated, to insure that the compressor meets air quality specifications.

CHAPTER 4. PROTECTION FOR HEAD, FACE, EYE, AND EAR

4-1 INTRODUCTION TO HEAD PROTECTION

Head protection should be worn on any job (a) where hazards exist from falling or flying objects, or impacts, (b) where there is a possibility of the head contacting electrical cables or power lines, (c) where hair may be caught in moving or rotating machinery, and (d) for sanitary reasons in excessively dirty or dusty atmospheres.

To accommodate this range of applications, protective headgear is manufactured in a wide variety of styles and materials. Most (but not all) rigid styles will give some protection against electrical shock as well as impact blows, but special models having no holes and no metal parts and high dielectric properties are available for use by linemen, electricians, and others who are regularly exposed to high voltage lines or switchgear. Metal hats or caps should never be worn around electrical equipment.

Cloth caps or hats are normally used when the problem involves primarily cleanliness, confinement of hair, or protection against flying sparks and/or hot metal, with no impact or electrical hazard present. In the case of women working around moving machinery, the cap style is preferred because the beak touching a machine provides a warning that the operator's head is too close.

Other specialized forms of head protection include hoods to be used in abrasive blasting operations or to guard against gases and chemicals, welding helmets, and crash helmets for motorcyclists, armored vehicle operators, and aviation personnel. Various accessory items, including chin straps, winter liners, and lamp brackets, may be used in conjunction with rigid type hats and caps where conditions warrant. NOTE: Consult appendix B, "Safety Item Index" for special head protection clothing and equipment not included in this chapter.

4-1.1 SPECIAL PURPOSE PROTECTIVE BODY CLOTHING, ENSEMBLES, AND SUITS FOR THE HEAD, FACE, EYE, AND EAR — CROSS REFERENCE

Aviation — Chapter 9

Divers — Chapters 4 and 15

Fire Fighters Clothing — Chapter 14

Rocket Fuel Handlers, Full and Limited Protection — Chapter 17

Toxicological Agents, Protective — Chapter 10

Extreme Temperature and Weather Conditions — Chapter 15

Goggles, Laser, and Melters — Chapter 16

Handlers of Chemical Agents

(1) Clothing Outfit, Chemical, Protective — Chapter 11

(2) Suit, Chemical, Protective — Chapter 11

Handlers of Toxic Chemical Agents — Protective Outfit Impermeable Supplied Air, M5 — Chapter 11

Handlers of Vesicant Gases — Chapter 11

Hood, Abrasive Blasting — Chapter 3

Lineman, Electrical — Chapter 13

Respiratory Protection — Chapter 3

Suit, Radiation Hazard, Disposable — Chapter 16

Suit, Switchers, Electrical — Chapter 13

Suit, Tear-off, Handlers of Aluminum Alkyls, and other similar products — Chapter 14

Welders — Chapter 14

4-2 AMERICAN NATIONAL STANDARDS INSTITUTE SAFETY REQUIREMENTS FOR INDUSTRIAL HEAD PROTECTION (ANSI Z89.1-1969).*

GENERAL REQUIREMENTS

Each helmet shall consist essentially of a shell and suspension. Provision shall be made for ventilation between the headband and shell.

Shell. The shell shall be dome-shaped, of one-piece seamless construction. There shall be no holes in the shell except those for mounting suspensions or accessories.

Headband. Headbands shall be of leatherette, plastic, or other suitable materials that are comfortable.

Sweatband. Sweatbands shall be made of leatherette, plastic, or other suitable materials that are comfortable.

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Crown Straps. Crown straps should be made of plastic, closely-woven webbing, or other suitable material, and conform comfortably to the shape of the wearer's head.

Chin Strap and Nape Strap. The chin strap and nape strap shall be adjustable and made of closely-woven webbing, leather, elastic-webbing combination, plastic, or other suitable material not less than 1/2 inch in width.

Winter Liners. Winter liners should be made of fabric, plastic, or other suitable material. Colored materials shall be fast-dyed. The outer surface may be water-resistant.

Face Shields and Welding Helmets. When worn in conjunction with industrial protective helmets, face shields and welding helmets shall meet the requirements set forth in the current American National Standard Practice for Occupational and Educational Eye and Face Protection, Z87.1-1968, or the latest revision thereof. When so worn, helmets may be without peaks or brims.

Lamp Bracket. The lamp bracket, if supplied, shall be plastic or other suitable material to hold the lamp properly. The bracket shall be designed to provide proper beam angle when the helmet is worn in the normal position.

Instructions. Each helmet shall be accompanied by instructions explaining the proper method of adjusting the suspension and headband.

Marking. Each helmet shall be identified on the inside of the shell in letters not less than 1/8 inch high, with the name of the manufacturer, the American National Standard designation and class. For example:

Manufacturer
ANSI Z89.1-1969
Class A

Types and Classes. Protective helmets shall be of the following types and classes:

Type 1 — Helmet, full brim

Type 2 — Helmet, brimless with peak

Class A — Limited voltage protection

Class C — No voltage protection

Class D — Limited voltage protection, Fire Fighters' Service, Type 1 only.

4-3 PROTECTIVE CLOTHING AND EQUIPMENT FOR THE HEAD

A. CAP, CLEAN ROOM: WHITE ORLON/DACRON

Source: LIN 81120N

Use: Individual engaged in NIKE potentiometer rebuild, inspection, or other work requiring dustfree and lintfree clothing.

B. CAP, MINERS: WITH REPLACEABLE SWEATBANDS AND WITH BRACKET FOR MINERS LAMP (fig. 4-1)



Figure 4-1. Cap, Miners: With Replaceable Sweatbands and with Bracket for Miners Lamp.

Source: LIN 81136N — for Cap
LIN 45188N — for Lamp

Use: Individual working in areas of high concentration of explosive gases or dust and smokeless powder magazine.

C. CAP, PROTECTIVE MAINTENANCE PERSONNEL: ADJUSTABLE (fig. 4-2)

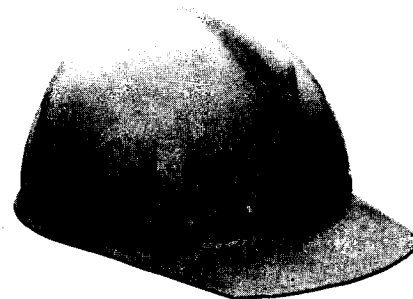


Figure 4-2. Cap, Protective Maintenance Personnel: Adjustable.

Source: LIN 81141N

Use: Per individual on jobs exposed to hazards of falling objects ILO protective helmets or hats.

D. CAP, PROTECTIVE MAINTENANCE PERSONNEL: ADJUSTABLE FLAMEPROOF COTTON TWILL

Source: LIN 81143N

Use: Per individual whose job involves work with explosive or flammables.

E. CAP, PROTECTIVE MAINTENANCE PERSONNEL: MALE AND FEMALE, LEATHER

Source: LIN 81153N

Use: Per individual whose work requires protection against flying sparks, etc., ILO other protective headgear.

F. CAP, PROTECTIVE MAINTENANCE PERSONNEL: PAINTERS, COTTON

Source: LIN 81157N

Use: Per individual requiring head protection from spray or dust on such jobs as spray painting, metal finishing, acid or caustic handling, gas handling, munitions handling, and strip coat spraying.

G. CAP, PROTECTIVE MAINTENANCE PERSONNEL: POWDER SHOP, WHITE DRILL

Source: LIN 81160N

Use: Per individual on jobs concerned with removal of ammunition, worn as protection and to prevent transporting of explosives dust from work areas.

H. CAP, PROTECTIVE MAINTENANCE PERSONNEL: WOMEN, ADJUSTABLE FABRIC, HAIR

Source: LIN 81166N

Use: Per female whose duty requires protection where operating equipment or working with explosives.

I. HAT AND INSECT NET: WITH CHIN STRAP 0G107

Source: LIN K-19869

NSN 8415-00-935-2885 through 2897

Use: For protection against mosquitoes and other insects.

NOTE: Other items for head and body protection against insects.

J. INSECT BAR: NYLON NETTING, MILDEW RESISTANT TREATED, FIELD TYPE

Source: LIN K-85092

NSN 7210-00-266-9736

Use: To spread over sleeping area.

K. INSECT NET HAT: ELASTIC, DRAW TAPE CLOSURE, DARK GREEN 323

Source: LIN K-85122

NSN 8415-00-935-2914

L. INSECT NET HEAD: ELASTIC, DRAW TAPE CLOSURE, DARK GREEN 323

Source: LIN K-85127

NSN 8415-00-935-3130

M. HAT, PROTECTIVE ALUMINUM (fig. 4-3)

A lightweight aluminum impact-resisting hat, natural anodized color, with rolled edge brim and adjustable lining.

Source: Appendix A

Use: By personnel working outdoors in hot weather where head protection from falling objects is required.

Limitation: Must not be used around electric equipment or apparatus, overhead transmission lines, energized cable or conduit, or any other place where the wearer might be exposed to contact with any source of electrical energy.

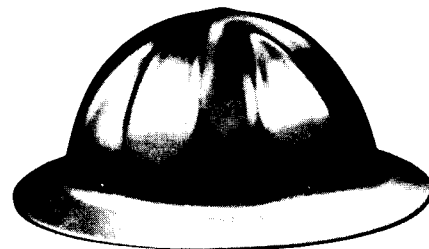


Figure 4-3. Hat, Protective Aluminum.

N. HELMET, ARMORED VEHICLE, CREWMAN: WITH COMMUNICATIONS SYSTEM

Source: LIN K-33400

NSN 8415-00-094-2679 Small

NSN 8415-00-094-2684 Large

NSN 8415-00-094-2691 Medium

(NSN 5965-00-135-0505/0507-Earcup seal replacements)

Use: Per nomenclature description.

O. HELMET, CONSTRUCTION WORKERS (fig. 4-4)

A rigid type helmet with full floating adjustable suspension.

Source: LIN 83481N

Use: For protection against falling, flying, or protruding objects. Also for protection against head contact with electrical current up to 10,000 volts.

Limitation: Hats or caps made of metal or containing metal rivets should not be used around electrical cables or equipment.

NOTE: Also see "Hat, Safety Lineman's—Electrical," chapter 13.

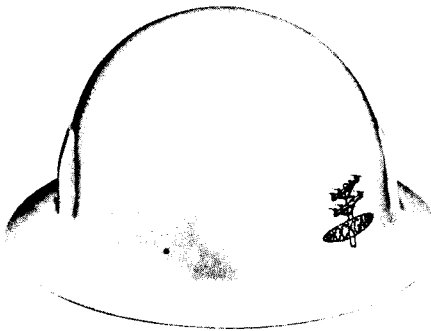


Figure 4-4. Helmet, Construction Workers.

P. HELMET, CRASH, MOTORCYCLIST'S

A tank or safety football type; semirigid helmet.

Source: LIN 83491N

Use: By test drivers of CVEH, motorcycle operators, aircraft passengers, NOA, personnel working on jobs where there is danger of head injury from impact with hard surface, and auxiliary firefighters as required to meet minimum requirements when authorized by installation commander.

Q. LINER, WINTER: CONSTRUCTION WORKERS HELMET (fig. 4-5)

A wind repellent, poplin liner with suede inner surface, adjustable chin strap and means for fastening to helmet suspension; covers head, ears, and neck.

Source: NSN 8415-00-634-5278



Figure 4-5. Liner, Winter: Construction Workers Helmet.

Use: By personnel issued construction workers helmet when required in cold weather.

R. LINER, SAFETY HELMET

A water repellent material with chin strap and lacing; sizes 6-3/4 to 7-1/2.

Source: NSN 8415-00-634-5278

Use: By personnel issued safety helmets when required by weather conditions.

(NOTE: The following is not a part of American National Standard Specifications for Industrial Head Protection, Z89.1-1969, but is included for information purposes only.)

4-3.1 RECOMMENDATIONS CONCERNING HEAD PROTECTION

Laces. Laces, if any, should always be tied securely with a square knot.

Painting and Cleaning. Caution should be exercised if shells are to be painted, since some paints and thinners may attack and damage the shell and reduce protection. The manufacturer should be consulted with regard to paints or cleaning materials for their particular products. A common method of cleaning and sterilization of shells is dipping them in hot water (approximately 140°F) containing a good detergent, for at least a minute. Shells should then be scrubbed and rinsed in clear water (approximately 140°F). After rinsing, the shell should be carefully inspected for any signs of damage.

Periodic Inspection. All components, shells, suspensions, headbands, sweatbands, and any accessories should be visually inspected daily for signs of dents, cracks, penetration, or any other damage due to impact, rough treatment, or wear that might reduce the degree of safety originally provided. Any industrial protective helmet that

requires replacement, or replacement of any worn, damaged, or defective part, should be removed from service until the condition of wear or damage has been corrected.

Limitation of Protection. Industrial protective helmets are designed to provide optimum protection under average conditions. Users are cautioned that if unusual conditions prevail (such as higher or lower extremes of temperature than described, or other unusual conditions), or if there are signs of abuse or mutilation of the helmet or any component, the margin of safety may be reduced.

Sizes. Provisions may be made by the manufacturers of industrial protective helmets for extra-small or extra-large sizes.

Precautions. Industrial protective helmets should not be stored or carried on the rear-window shelf of an automobile, since sunlight and extreme heat may adversely affect the degree of protection. Also, in the case of emergency stops or accident, the helmet might become a hazardous missile.

The addition of accessories to the helmet may adversely affect the original degree of protection.

4-4 INTRODUCTION TO FACE PROTECTION

Face protection is closely related to head protection and is frequently incorporated with protective headgear as in the case of hoods, welding helmets, and flying helmets. When separate face protection is desired, the most common form is a faceshield. These shields are normally mounted on a lightweight, hat-type suspension and provide full face and eye protection without interfering with vision. They are used to protect against chemical splashes, sparks, and light flying objects.

NOTE: For chemical eye and face wash station and shower emergency, see chapter 11.

4-4.1 AMERICAN NATIONAL STANDARDS INSTITUTE SAFETY REQUIREMENTS FOR INDUSTRIAL EYE AND FACE PROTECTION (ANSI Z87.1-1968).*

GENERAL REQUIREMENTS

a. Eye and face protection in a manner pro-

vided by this standard shall be required where there is a reasonable probability of injury that can be prevented by such protection.

- b. In such cases, employers or educational authorities shall make conveniently available a type of protector suitable for the work to be performed, and employees or students shall use such protectors.
- c. No unprotected person shall knowingly be subjected to a hazardous environmental condition.
- d. Protectors shall meet the following minimum requirements:
 - (1) They shall provide adequate protection against the particular hazards for which they are designed.
 - (2) They shall be reasonably comfortable when worn under the designated conditions.
 - (3) They shall fit snugly and shall not unduly interfere with the movements of the wearer.
 - (4) They shall be durable.
 - (5) They shall be capable of being disinfected.
 - (6) They shall be easily cleanable.
- e. Protectors should be kept clean and in good repair.
- f. Suitable eye protectors shall be provided where machines or operations present the hazard of flying objects, glare, liquids, injurious radiation, or a combination of these hazards.
- g. Persons whose vision requires the use of corrective lenses in spectacles, and who are required by this standard to wear eye protection, shall wear goggles or spectacles of one of the following types:
 - (1) Spectacles whose protective lenses provide optical correction,
 - (2) Goggles that can be worn over corrective spectacles without disturbing the adjustment of the spectacles,
 - (3) Goggles that incorporate corrective lenses mounted behind the protective lenses.
- h. Every protector shall be distinctly marked to facilitate identification only of the manufacturer.

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- i. When limitations or precautions are indicated by the manufacturer, they shall be transmitted to the user and care taken to see that such limitations and precautions are strictly observed.
- j. Such devices should be worn over suitable basic eye protection devices.

4-5 PROTECTIVE EQUIPMENT FOR THE FACE

A. FACE SHIELD, INDUSTRIAL, HINGED WINDOW (fig. 4-6)

An adjustable, clear or tinted plastic face shield mounted on a head frame. Available in different thicknesses for varying degrees of impact.

Source: LIN H-30636
NSN 4240-00-439-3450

Use: By personnel engaged in grinding, light chipping, or other occupations requiring a protective shield.

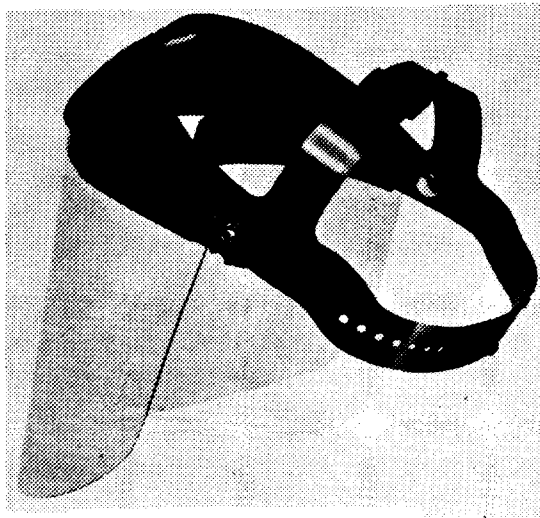


Figure 4-6. Face Shield, Industrial, Hinged Window.

B. FACE SHIELD, INDUSTRIAL, NON-HINGED WINDOW

Clear or tinted plastic face shield mounted on a head frame. Available in different thicknesses for varying degrees of impact.

Source: NSN 4240-00-965-1268

Use: For protection against corrosive chemicals and by personnel required to work on decontamination of guided missiles, NOA.

C. FACE SHIELD, PLASTIC (RIOT CONTROL)

Source: LIN 51936N

Reference: CTA 50-900 for ARNG Control

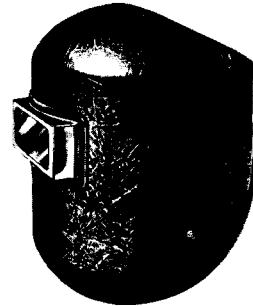


Figure 4-7. Helmet, Welder's.

D. HELMET, WELDER'S (fig. 4-7)

Black fiber welder's helmet with fixed lens retainer and adjustable fiber head suspension without filter or cover plates.

Source: NSN 4240-00-268-9792
MOS 44A and 44C NOA
NSN 4240-00-540-0623
MOS 44A and 44C NOA

Use: General welding operations.

NOTE: See "Fire, Heat, and Explosion" for additional items of personal protection for welders including special helmets, chapter 14.

E. MASK, DIVER'S: TRIANGLE FRAME PLASTIC WINDOW QUICK RELEASE CLAMP HARNESS

Source: LIN M-12443
NSN 4220-00-223-6665

Use: By individuals engaged in diving operations.

NOTE: For diver underclothing, see "Extreme Temperature and Weather Conditions," chapter 15.

F. MASK, NITROMETER, FULL FACE WITH WINDOW (fig. 4-8)

A special, rigid-type, adjustable face shield mounted on a fiber headframe. Gives partial head and neck protection.

Source: Appendix A.

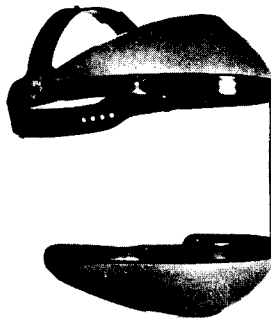


Figure 4-8. Mask, Nitrometer,
Full Face with Window.

Use: For general protection against corrosive chemical splashes. May be used by personnel required to work on decontamination of guided missiles.

4-6 INTRODUCTION TO EYE PROTECTION

The types of protective eyewear listed in this section are intended to provide protection against flying particles, visible and invisible light that may be injurious to the eye, chemicals, liquids and powders, hot and molten metals, and miscellaneous dusts and fumes. Eyewear designed to protect against flying particles or heavy impact, such as encountered in grinding, woodworking machine operations, drilling, etc., have toughened glass lenses inserted in the eye-cups of goggles or spectacles. Whenever the lenses become scratched, chipped, or pitted, the lenses should be replaced because they have been weakened and no longer provide adequate protection. Exposure to sunlight glare and stray light from welding, cutting, and metal-pouring, in which visible or invisible light such as ultraviolet and infrared rays are encountered, require the use of filter lenses. Design, construction, testing, and use of devices for eye protection is in accordance with ANSI Z87.1-1968.

NOTE 1: See table 4-1 for "Selection Chart, Recommended Eye and Face Protectors...."

NOTE 2: See table 4-2 for "Selection of Shade Numbers for Welding Filters."

NOTE 3: See "Fountain, Eye and Face Wash Station," and "Shower, Emergency," section 11-4, items F and H, respectively.

NOTE 4: See "Goggles, Laser," for laser protection, section 16-2, item M.

4-6.1 PROTECTIVE EQUIPMENT FOR THE EYES

A. GLASSES, SHOOTING AMBER WITH CASE

Source: LIN 82856N

Use: For motorcyclist performing escort duty during hours of darkness and inclement weather.

B. GLASSES, SUN, CLIP-ON

Glass lens, green, neutral, or polarized for attachment to spectacles.

Source: LIN 82873N

Use: For protection against sunlight glare.

C. GLASSES, SUN, SPECTACLE TYPE

Spectacle-type sun glasses.

Source: LIN J-61584

NSN 8465-00-161-9415

Spec JAN

Use: For protection against sunlight glare.

NOTE: See "Sunglasses, Aviation," chapter 9.

D. GLASSES, SAFETY, SPECTACLE TYPE

Standard safety spectacles that meet design, construction, testing, and use criteria for devices for eye protection, in accordance with ANSI Standard Z87.1-1968 with or without side shields, either plano or prescription. Available in various styles, sizes, and colors.

Source: Appendix A

Use: By service and maintenance personnel, carpenters, construction workers, mechanics, machine tool operators, electricians, electrical linemen, sewing machine operators, metal workers or other personnel exposed to flying particles or objects which might cause eye injuries but for which heavy, industrial-type goggles or special forms of eye protection are not required; and for all personnel with useful vision in only one eye regardless of the degree of eye hazard associated with their present occupation.

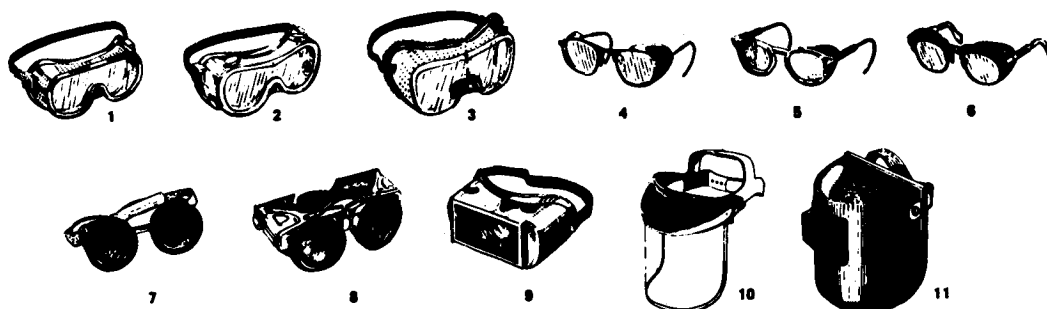
E. GOGGLES, DUST, WITH EITHER CLEAR OR GREEN FRAME AND LENS FOR PRESCRIPTION GLASSES (fig. 4-9)

A soft plastic, ventilated goggle with replaceable lens for wearing over regular glasses to protect against wind and dust.

Source: LIN 82941N

Table 4-1. Selection chart
(ANSI Z87.1-1968)†

Recommended Eye and Face Protectors for Use in Industry, Schools, and Colleges



1. GOGGLES, Flexible Fitting, Regular Ventilation
 2. GOGGLES, Flexible Fitting, Hooded Ventilation
 3. GOGGLES, Cushioned Fitting, Rigid Body
 *4. SPECTACLES, Metal Frame, with Sideshields
 *5. SPECTACLES, Plastic Frame, with Sideshields
 *6. SPECTACLES, Metal-Plastic Frame, with Sideshields
 ** 7. WELDING GOGGLES, Eyecup Type, Tinted Lenses (Illustrated)
 7A. CHIPPING GOGGLES, Eyecup Type, Clear Safety Lenses (Not Illustrated)
 ** 8. WELDING GOGGLES, Coverspec Type Tinted Lenses (Illustrated)
 8A. CHIPPING GOGGLES, Coverspec Type, Clear Safety Lenses (Not Illustrated)
 ** 9. WELDING GOGGLES, Coverspec Type, Tinted Plate Lens
 10. FACE SHIELD (Available with Plastic or Mesh Window)
 **11. WELDING HELMETS

*Nonsideshield spectacles are available for limited hazard use requiring only frontal protection.
 **See chart "Selection of Shade Number for Welding Filters."

APPLICATIONS		
OPERATION	HAZARDS	RECOMMENDED PROTECTORS: <small>Bold Type Numbers Signify Preferred Protection</small>
ACETYLENE—BURNING ACETYLENE—CUTTING ACETYLENE—WELDING	SPARKS, HARMFUL RAYS, MOLTEN METAL, FLYING PARTICLES	7, 8, 9
CHEMICAL HANDLING	SPLASH, ACID BURNS, FUMES	2, 10 (For severe exposure add 10 over 2)
CHIPPING	FLYING PARTICLES	1, 3, 4, 5, 6, 7A, 8A
ELECTRIC (ARC) WELDING	SPARKS, INTENSE RAYS, MOLTEN METAL	9, 11 (11 in combination with 4, 5, 6, in tinted lenses, advisable)
FURNACE OPERATIONS	GLARE, HEAT, MOLTEN METAL	7, 8, 9 (For severe exposure add 10)
GRINDING—LIGHT	FLYING PARTICLES	1, 3, 4, 5, 6, 10
GRINDING—HEAVY	FLYING PARTICLES	1, 3, 7A, 8A (For severe exposure add 10)
LABORATORY	CHEMICAL SPLASH, GLASS BREAKAGE	2 (10 when in combination with 4, 5, 6)
MACHINING	FLYING PARTICLES	1, 3, 4, 5, 6, 10
MOLTEN METALS	HEAT, GLARE, SPARKS, SPLASH	7, 8 (10 in combination with 4, 5, 6, in tinted lenses)
SPOT WELDING	FLYING PARTICLES, SPARKS	1, 3, 4, 5, 6, 10

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**Table 4-2. Selection of shade numbers
for welding filters
(ANSI Z87.1-1968)***

The following is a guide for the selection of the proper shade numbers of filter lenses or plates used in welding. Shades more dense than those shown for various operations may be selected to suit the individual's needs.

<u>Welding operation</u>	<u>Suggested shade number</u>
Shielded metal-arc welding 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes	10
Gas-shielded arc welding (nonferrous) 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes	11
Gas-shielded arc welding (ferrous) 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes	12
Shielded metal-arc welding 3/16-, 7/32-, 1/4-inch diameter electrodes	12
5/16-, 3/8-inch diameter electrodes	14
Atomic hydrogen welding	10-14
Carbon-arc welding	14
Soldering	2
Torch brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, 1 inch to 6 inches	4 or 5
Heavy cutting, over 6 inches	5 or 6
Gas welding (light), up to 1/8 inch	4 or 5
Gas welding (medium), 1/8 inch to 1/2 inch	5 or 6
Gas welding (heavy), over 1/2 inch	6 or 8

NOTE: See ANSI Standard, Safety in Welding and Cutting, Z49.1-1973.

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**Figure 4-9. Goggles, Dust,
with Either Clear or Green Frame and Lens
(for prescription glasses).**

Use: By personnel wearing prescription glasses and assigned to vehicles.

F. GOGGLES, EYECUP, PROTECTIVE, CHIP- PERS AND GRINDERS (fig. 4-10)

A close-fitting industrial goggle with flat, impact-resisting lenses.

Source: LIN 52500N

Use: By personnel engaged in grinding or chip-
ping operations ILO face shield.



**Figure 4-10. Goggles, Eyecup, Protective,
Chippers and Grinders.**

G. GOGGLES, EYECUP, PROTECTIVE, WELDER'S (fig. 4-11)

A welder's goggles to protect against intense infrared and ultraviolet light encountered in welding operations. Has adjustable nose bridge, circular lenses mounted on each cup by screw-on retaining ring and protected by clear cover lens.

Source: LIN 5250N

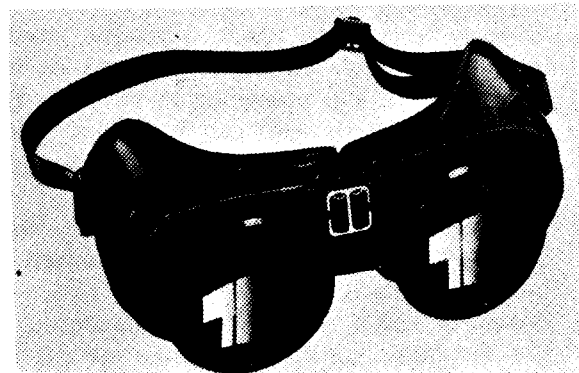
Use: By personnel requiring protection against
injurious radiant energy.

H. GOGGLES, SUN, WIND, AND DUST

A single aperture type, close fitting goggle
with elastic headband and two plastic lenses.

Source: LIN J-71304

NSN 8465-00-161-4068



**Figure 4-11. Goggles, Eyecup,
Protective, Welder's.**

Use: For motorcycle operators, wiremen, crew-
men of combat vehicle, aircraft mechanics, heli-
copter crew chief; crushing and screening plant.

I. GOGGLES, INDUSTRIAL

Source: CTA 50-970 Expendable items list five
different industrial-type goggles

Use: Per individual as required.

J. DISPENSER CABINET LENS PAPER AND SOLUTIONS WITH ANTIFOGGING STATION

A dispenser cabinet containing material in liquid, stick, or paste form with a cloth for application. Also available is dispenser cabinet containing lens cleaning solution and paper.

Source: LIN 51350N

Use: Antifogging kit — Application to inside of lens to prevent fogging for eye protective equipment, such as goggles, spectacles, and respirators.

Lens cleaning kit — Application to both sides of lens to improve visibility; cleaning function.

4-6.2 MAINTENANCE AND DISINFECTION OF EYE PROTECTORS (ANSI Z87.1-1968).*

- a. It is essential that the lenses of eye protectors be kept clean. Continuous vision through dirty lenses can cause eye fatigue and become a contributory factor to accidents. Daily cleaning of eye protectors is recommended.
- b. Pitted or scratched lenses reduce vision and seriously reduce protection. They shall be replaced immediately.
- c. Replace headbands. Slack, worn-out, sweat-soaked, knotted, or twisted headbands do not hold the eye protector in proper position. Visual inspection can determine when the elasticity is reduced to a point beyond proper function.
- d. To prolong the life of eye protectors, they shall be placed in suitable cases or containers between periods of use.
- e. Protectors are a personal item and should be for the individual and exclusive use of the person to whom they are issued. If circumstances require reissue, the protectors shall be thoroughly cleaned and disinfected as hereinafter described.
- f. **General.** When a person is assigned protective equipment, it is recommended that this equipment be cleaned and disinfected regularly, without sharing by another person unless disinfected as herein specified.
- g. **Procedure.** Thoroughly clean all surfaces with soap or suitable detergent, and warm water. Carefully rinse all traces of soap or

detergent. Completely immerse the protector for 10 minutes in a solution of modified phenol, hypochlorite, or quaternary ammonium compounds, in a strength specified by the manufacturer, at a room temperature of 68°F. Remove protector from solution and suspend in a clean place for air drying at room temperature, or with heated air. Do not rinse because this will remove the residual effect.

Ultraviolet disinfecting equipment may be utilized in conjunction with the washing procedure above, when such equipment can be demonstrated to provide comparable disinfection.

Protectors showing need for extensive cleansing should be disassembled to the extent possible without tools, prior to the washing and disinfection procedure. Replace defective parts with new ones.

- h. **Storage.** The dry parts or items should be placed in clean, dust-proof containers to protect them.

4-7 INTRODUCTION TO EAR PROTECTION

The optimum solution to a noise hazard is to evaluate the source of the noise and to reduce the noise to a tolerable level through redesign or modification of the noise-producing device or mechanism. Reference TB (251 MED) Noise and Conservation of Hearing.

Satisfactory results may also be obtained by using silencing enclosures and sound absorption or deflection devices. When the above approaches to the noise level are either impractical or uneconomical, then protection must be provided to the personnel who will be exposed to the hazardous noise. This section describes the ear protection available for individual use. Ear protection should be worn whenever indicated by noise surveys, or when noise is irritating to the individual. NOTE: Plain cotton is not an acceptable protective device.

There are in general four types of hearing protectors: (1) ear plugs, (2) ear canal cap, (3) the earmuff, and (4) helmet type. Hearing protectors are more efficient in attenuating the noise level in the high frequency ranges than in the low frequency ranges.

Well-designed and properly fitted ear plugs or muffs will provide attenuation of noise reach-

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ing the inner ear of from 15 decibels in the lower frequencies to 35 decibels in the higher frequencies. Wearing of plugs and muffs in combination provides 35 to 40 decibels noise attenuation at most frequencies.

The above values are contingent upon an optimum fit of the ear plug in the ear canal and of the earmuff around the ear; therefore, it is important that ear protectors be carefully fitted to the individual by competent medical personnel. Accurate calibration of sound-measuring instruments is necessary to insure the validity of readings.

4-7.1 PROTECTIVE EQUIPMENT FOR THE EAR

A. AURAL PROTECTOR, SOUND (EAR MUFF) (fig. 4-12)

Made of rigid plastic ear cups lined with foamed plastic or rubber with adjustable spring-type headbands.

Source: NSN 4240-00-759-3290
NSN 4340-00-022-2946
NSN 5965-00-168-9624
NSN 5965-00-226-7870
Appendix A

Use: Per individual exposed to noise levels above 85 decibels; individual whenever noise levels exceed those described as hazardous in TB MED 251. This type of hearing protection is most useful where frequency of ear protection removal is desired.

B. PLUG, EAR, HEARING PROTECTIVE, UNIVERSAL

Made of rubber or plastic and designed to fit into the outer portion of the ear canal. Available in various sizes.

Source: NSN 6515-00-137-6345
Appendix A

Use: When the bulk of the earmuff or helmet is undesirable.

NOTE: Case for above: NSN 6515-00-299-8287.

C. EAR-CANAL CAPS

Two plugs mounted on a metal adjustable headband inclosed in a plastic tube.

Source: FSC C-6515 IL

Use: When hazardous noise exposure is intermittent and the bulk of earmuff or helmet is undesirable.

D. HELMET TYPE EAR PROTECTORS

A fabric-type helmet with the earmuffs attached on the inside. Available in various head sizes.



Figure 4-12. Aural Protector, Sound (Ear Muff).

Source: Appendix A.

Use: When ear protection and head coverage is desired for personnel exposed to cold weather or in windy areas for prolonged periods.

E. METER, SOUND LEVEL (fig. 4-13)

A lightweight, portable device to indicate noise levels up to 140 decibels. It is independent of frequency and is battery powered.

Source: LIN 14499N
NSN 6515-00-236-1204

Use: By trained medical personnel where octave band analysis of noise source is not necessary.

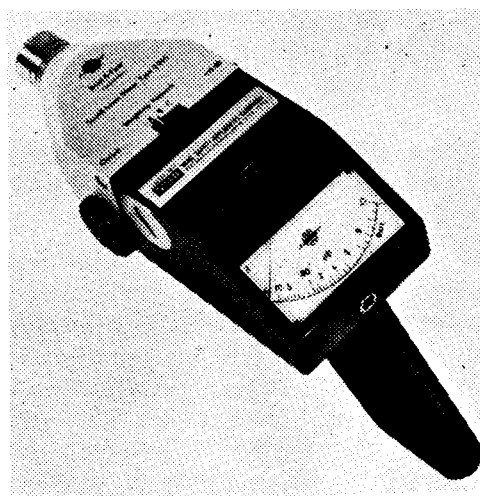


Figure 4-13. Meter, Sound Level.

Limitation: Limited to noise levels up to 140 to 150 decibels, independent of frequency. Cannot be used to measure impulsive noise (gunfire).

F. VALVE, EAR (fig. 4-14)

An earplug of molded soft elastomeric material usually supplied in plastic carrying case.

Source: Appendix A

Use: By personnel exposed to extremely loud repetitive sounds, such as gunfire, riveting, operation of heavy metal processing equipment, air hammers, etc.

Limitation: For more hazardous noise areas, a cup-type device providing additional attenuation should be used.



Figure 4-14. Valve, Ear.

G. OCTAVE BAND NOISE ANALYZER, CONSISTING OF METER, NOISE ANALYZER, AND MICROPHONE

For measuring the sound level at specific frequency bands over the audible range. The unit is battery powered.

Source: LIN 14500N - Meter
LIN 14935N - Microphone

Use: By trained medical personnel, to determine sound levels at various frequencies in order to determine the most effective remedial measures.

H. NOISE-MEASURING INSTRUMENT: AUDIO DOSIMETER AND READOUT UNIT (fig. 4-15)

The dosimeter consists of a nondirectional microphone connected to a pocket-sized case containing a replaceable integrating memory cell and circuitry. The microphone can be clipped to an individual's shirt collar, and the case clipped to a belt or worn in shirt pocket. The dosimeter is supplied in kit with battery and memory cells.

The readout unit is a desktop model which displays a percentage reading of OSHA permis-

sible sound exposure. Reading is obtained by inserting an "exposed" memory cell into the socket on the face of the unit.

Source: Appendix A

Use: To measure and record personal exposure to noise under actual working conditions.

4-7.2 MAINTENANCE AND DISINFECTION OF EAR PROTECTORS

The types of ear protectors used should be prescribed by the medical department. After use, the ear protectors should be cleaned and stored in a clean, dust-free container. If the ear protective devices have been maintained in general storage, they should be cleaned prior to use. Mild soap and water are recommended for cleaning.

Warning: Solvents should never be used as they have an adverse effect upon rubber and plastic.

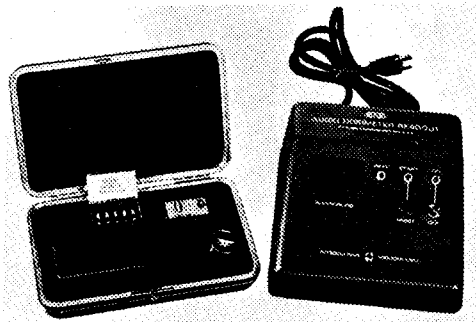


Figure 4-15. Noise-Measuring Instrument: Audio Dosimeter and Readout Unit.

4-7.3 SELECTED PORTIONS FROM DEPARTMENT OF THE ARMY TECHNICAL BULLETIN TB MED 251, "NOISE AND CONSERVATION OF HEARING"

"5. Noise Hazard Evaluation (Noise Survey) and Exposure Criteria.

"a. Hazard Evaluation—Steady Noise. At all locations where noise makes it difficult for two persons with good hearing to converse at close range, tests should be made with a sound level meter using its A-weighting network and slow meter response. The meter reading is referred to as dB(A). The average sound level A is determined by readings at the approximate position of the worker's more exposed ear. A sufficient number of readings should be made to reflect variations in noise levels resulting from changes in operating schedules or work pro-

cedures. If the noise exposure is not continuous, the total time the noise is 'on' throughout a typical day should be determined. The results should be recorded and a record kept of all areas or activities where hazardous exposures exist.

"b. Exposure Criteria—Steady Noise.

"(1) For hearing conservation purposes, the maximum recommended exposure to single-level steady noise in dB(A) varies with the duration of the exposure as shown in table 1. IT IS A GOOD RULE OF THUMB THAT HEARING CONSERVATION MEASURES SHOULD BE INITIATED WHEN AN INDIVIDUAL IS EXPOSED TO STEADY NOISE LEVELS ABOVE 85dB(A).

Table 1. Maximum Recommended Sound Level Exposure to Steady Noise Measured in dB(A)

Exposure duration per day in hours*	Maximum dB(A) (re: 0.0002 dyne per sq cm)
8	85
6	87
4	90
3	92
2	95
1½	97
1	100
½	105
¼ or less	110 (ceiling)

*For exposures of less than 8 hours, the importance of determining the total time the noise is "on" and the maintenance of records, as described in a above, is emphasized.

"(2) When the daily exposure is composed of two or more periods of different noise levels, the levels and exposure durations are combined as follows to determine whether the maximum recommended exposure is exceeded:

$$\text{If the sum of } \frac{A_1}{T_1} + \frac{A_2}{T_2} + \dots + \frac{A_n}{T_n} > 1$$

(exceeds unity), the maximum recommended exposure is exceeded. A indicates ACTUAL exposure duration at the different noise levels, and T the exposure TIME permitted at each level as determined from table 1. Exposures of less than

85 dB(A) are disregarded. For example, an individual's exposure during an 8-hour day is:

85 dB(A)—0.5 hr

87 dB(A)—1.0 hr

92 dB(A)—0.5 hr

The combined exposure is

$$\frac{0.5}{8} + \frac{1.0}{6} + \frac{0.5}{3} = 0.4 \text{ (less than unity).}$$

The exposure is therefore within maximum recommended limits.

"Note. Where the noise-measuring equipment does not have the A-weighting network, but is capable of making an octave band analysis, this analysis should be made and converted to an equivalent dB(A) by use of the conversion procedure described in section I of appendix A [of TB MED 251]. When such analyses have previously been made, they should similarly be converted. For reduction or control of noise by engineering means, an octave band analysis is required by acoustical engineers or consultants.

"c. Hazard Evaluation and Exposure Criterion—Impulsive Noise. The measurement of impulsive noise requires the use of special equipment and should be done only by specially trained personnel. Because of the complexity of the factors influencing the hazard from exposure to impulsive noise, it is feasible to establish only one maximum recommended exposure level for general use in hearing conservation programs. *This level is 140 dB peak.* All small arms used in the military produce impulsive noise above this level. Some persons may be susceptible to damage from lower levels. Medical surveillance is the only means of identifying these persons. When identified, appropriate recommendations to conserve their hearing should be made. HEARING CONSERVATION MEASURES SHOULD BE INSTITUTED AND ENFORCED WHEN FIRING ANY WEAPON DURING TRAINING.

"6. Posting of Noise-Hazardous Areas. Appropriate signs should be posted identifying noise-hazardous areas and indicating protection requirements. Signs should indicate daily exposure durations permitted without the use of protective equipment where applicable."

CHAPTER 5. PROTECTIVE BODY CLOTHING

5-1 INTRODUCTION

The standards of the Occupational Safety and Health Act give limited reference to protective clothing. This does not mean, however, that protective clothing is not required. On the contrary, suitable clothing must be provided for protection from injuries. The OSHA standards state this emphatically in broad terms.

These broad, general requirements are included in the opening paragraph 1910.132 of "Subpart I—Personal Protective Equipment," where it states that protective equipment (including personal protective equipment for eyes, face, head, and extremities), protective clothing, respiratory devices, and protective shields and barriers must be provided, used, and maintained in a sanitary and reliable condition wherever they are needed because hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants could cause injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact.

Further, where employees provide their own protective equipment, the employer is still responsible for the adequacy, proper maintenance, and sanitation of that equipment.

These general requirements for protective clothing and other personal protective equipment also mandate that all such equipment must be of safe design and construction for the work to be performed.

Employers are given the full responsibility of deciding when protective clothing is needed and what types of clothing are required.

The OSHA standards do give some clues for industries or operations that particularly require safety clothing in specific references to protective clothing scattered through the standards.

CTA 50-900 (Note 96) provides the following guidance in the purchase of protective clothing:

Items purchased are to be of a design and construction of the most suitable materials which will afford the required protection against inclement weather and each specific hazard involved, such as:

- (1) Asbestos to protect against burns caused by flame, flying sparks, hot

metal or liquid splashes, hot objects, sustained direct or reflected heat, etc.

- (2) Rubber and synthetic rubber to protect against irritations, burns from acids, vapors, solvents, oils, grease, water, steam, alkalis, salts, electricity, other chemicals, and toxic material.
- (3) Leather to protect against scratches, cuts, bruises, abrasions, flying objects and minor impacts, sparks, hot splashes, etc.
- (4) Metal mesh to protect against cuts and abrasions.
- (5) Fiberglass to protect against oils, water, acids, alkalis, greases, fire, etc.
- (6) Fabric especially treated to protect against inclement weather and specific hazards.
- (7) Leather-lead, fiber-lead, and rubber-lead to protect against X-ray and beta radiation of atomic fission products, etc.

Regardless of the type of clothing used, however, there are some basic precautions that should be observed if the clothing itself is not to create an additional hazard:

- (1) No loose, torn, or ill-fitting clothing of any kind should be worn around rotating or reciprocating equipment.
- (2) When two-piece clothing is worn to protect against acids, caustics, or other dangerous liquids, the upper garment should always overhang the lower so that any liquid spills or splashes will run off toward the floor and will not be trapped inside the clothing itself. For the same reason, trousers should be cuffless and worn outside boots or shoes.
- (3) Similarly, coats and/or aprons should be removed before gloves when caustic or corrosive materials are being handled.
- (4) Any protective clothing worn over or in addition to normal clothing may cause an increase in body heat buildup and thereby reduce the sustained maximum work capacity of the user. See section 10-3.1.

5-1.1 SPECIAL PURPOSE PROTECTIVE BODY CLOTHING, ENSEMBLES, AND SUITS — CROSS REFERENCE:

Abrasive Blasting — Chapter 3
Aviation — Chapter 9
Body Armor — Chapter 5
Construction and Demolition Workers — Chapter 12
Divers — Chapters 4 and 15
Electrical Workers — Chapter 13
Ensemble Reflective Safety Clothing Marking — Chapter 18
Ensemble Trainer Dog Attack — Chapter 5
Extreme Temperature and Weather Conditions — Chapter 15
Fire Fighter's Clothing — Chapter 14
Fuel Handlers — Chapter 17
Handlers of Chemical Agents
(1) Clothing Outfit, Chemical, Protective — Chapter 11
(2) Suit, Chemical, Protective — Chapter 11
Handlers of Toxic Chemical Agents — Protective Outfit, Impermeable, Supplied Air, M5 — Chapter 11
Handlers of Vesicant Gases — Chapter 11
Nuclear Radiation Protective (Apron), Boots, Coveralls, Gloves, and Sleeves — Chapter 16
Respiratory Protection — Chapter 3
Suit, Radiation, Hazard, Disposable — Chapter 16
Suit, Switchers, Electrical — Chapter 13
Suit, Tear-off, Handlers of Aluminum Alkyls and Other Similar Products — Chapter 14
Toxicological Agents, Protective — Chapter 10
Welders — Chapter 14

5-2 LIMITED PROTECTIVE BODY CLOTHING

There are certain items of clothing that are worn in lieu of the regular military or ordinary civilian clothing because the nature of the occupation requires limited protection against relatively harmless liquids, acids, and stains, that could not be removed from the regular military or ordinary civilian clothing without damage. The clothing worn by personnel engaged in laboratory work, food handling, commissary workers, etc., is representative of the type mentioned above. This limited protective clothing is also worn for purposes of sanitation and uniformity of dress and to portray a connotation of cleanliness

in the area in which such items of clothing are authorized. Because of the general nature and widespread use of this type of clothing, a separate item listing is not contained in this pamphlet. Accordingly, users should consult CTA 50-900, CTA 50-970, and SB700-20 for particular items desired.

5-3 SPECIFIC PROTECTIVE BODY CLOTHING

Safety items listed in this category are designed, constructed, and/or treated to provide protection against a specific type of hazard such as concentrated acids, flying chips, hot sparks, sharp-edged tools, etc. In the performance of tasks involving a specific hazard, care should be taken by each worker and supervisor to assure that proper clothing and equipment are worn for protection against that hazard, e.g., rubber protective equipment for electrical workers; see chapter 13, "Special Safety Protective Clothing Equipment for Electrical Hazards," or consult Safety Item Index.



Figure 5-1. Apron, Blacksmith:
Bib-Type, Leather.

A. APRON, BLACKSMITH: BIB-TYPE, LEATHER (fig. 5-1)

A bib-type apron made of heavy-duty leather.

Source: LIN A-85905

NSN 8415-00-234-9254

Use: By personnel NOA whose duties involve contact with hot sparks, molten metal, flying chips, rough objects, edged tools, etc.

B. APRON, CONSTRUCTION WORKER'S: BIB-TYPE, COTTON

A short, cotton apron with neck loop, waist

ties, and chest and thigh pockets for holding small tools, nails, etc.

Source: LIN A-86042

NSN 8415-00-257-4290

Use: By personnel requiring protection against abrasive materials.

C. APRON, CONSTRUCTION WORKER'S: WAIST-TYPE, COTTON

A short apron-type garment containing two front-mounted pouches or pockets for holding small parts, with adjustable waist strap.

Source: LIN A-86179

NSN 8415-00-273-9664

Use: For holding bolts, nuts, and tools during construction of towers, bridges, buildings, etc., by individual requiring protection against abrasive material ILO apron LIN A-86042.

D. APRON, IMPERMEABLE: DUCK, RUBBER-COATED, BLACK (fig. 5-2)

A full body apron made of cotton duck, rubber coated, with shoulder straps and waist ties.

Source: LIN A-86590

NSN 8415-00-082-6108

Use: To protect clothing and skin when working with water, steam, acids, solvents, alkalis, and caustic solutions. Occupations: photography darkroom worker, steam cleaning worker, electroplater, battery handler, etc., or when requiring protection from grease, oil, and similar stains; also by light or heavy general support maintenance company.

Limitation: Should not be worn by mess attendants.



Figure 5-2. Apron, Impermeable:
Duck, Rubber-Coated, Black.

E. APRON, LABORATORY, PLASTIC, COLORLESS, BIB-TYPE

Source: LIN A-86864

NSN 8415-00-715-0450

Use: By personnel authorized to use impermeable rubber apron when plastic is more suitable (e.g., mess attendant) or in general work involving contact with water and steam.

F. APRON, MEAT CUTTER'S: BRASS, BIB, ADJUSTABLE STRAP

Source: LIN A-87275

NSN 8415-00-292-9967

Use: By meat cutter requiring protection from injury to chest, groin, abdomen, and other frontal areas of the body when cutting and boning meat.

G. APRON, WELDER'S: LEATHER, BIB, STRAP

Source: LIN A-87549

NSN 8415-00-250-2531

Use: By individual serving in supply tool room; individual NOA whose duty involves contact with hot sparks, molten metal, flying chips, rough objects, edged tools, etc.

H. APRON, WELDER'S: ASBESTOS, LEG LENGTH—see chapter 14.

I. BODY ARMOR, FRAGMENTATION, PROTECTIVE: FOR NECK AND TORSO (fig. 5-3)

Source: LIN A-92145

NSN 8470-00-122-1299

through 1302

J. BODY ARMOR, FRAGMENTATION, PROTECTIVE: FOR THE GROIN

Source: LIN A-92008

NSN 8470-00-753-6110

through 6117

K. BODY ARMOR, FRAGMENTATION, SMALL ARMS, PROTECTIVE: GUNNER CREW CHIEF, FRONT AND BACK PLATE

Source: LIN B-85126

NSN 8470-00-450-3698

through 3709



Figure 5-3. Body Armor, Fragmentation, Protective: for Neck and Torso.

L. BODY ARMOR, FRAGMENTATION, SMALL ARMS, PROTECTIVE: PILOT/CO-PILOT, FRONT (fig. 5-4)

Source: LIN B-85119
NSN 8470-00-450-3713
through 3724

M. BODY ARMOR, SMALL ARMS, PROTECTIVE: AIR CREWMAN, FRONT PLATE WITH VEST

Source: LIN B-85119
NSN 8470-00-450-3713
through 3724

N. BODY ARMOR, SMALL ARMS, PROTECTIVE: AIR CREWMAN, FRONT-BACK PLATE WITH VEST

Source: LIN B-85126
NSN 8470-00-450-3698
through 3709



Figure 5-4. Body Armor, Fragmentation, Small Arms, Protective: Pilot/Copilot, Front.

O. BODY ARMOR, SMALL ARMS, PROTECTIVE: GROUND TROOPS, FRONT-BACK PLATE WITH VEST (fig. 5-5)

Source: LIN B-85153
NSN 8470-00-141-0935
through 0938

P. CHAPS, LEATHER

A hip-length leather chap with belt support straps and fasteners for holding material against the legs.

Source: Appendix A

Use: For protection against radiant heat, sparks, flames, hot metal splashes, lightweight flying objects, acids, alkalis, oil, solvents, and concentrated solutions, ILO-type leg protection.

Q. COVERALLS, EXPLOSIVES HANDLERS—see chapter 14

R. COVERALLS, SAFETY, INDUSTRIAL: COTTON SATEEN, WHITE

Source: LIN F-33046
NSN 8415-00-782-6366
through 6371 (various sizes)

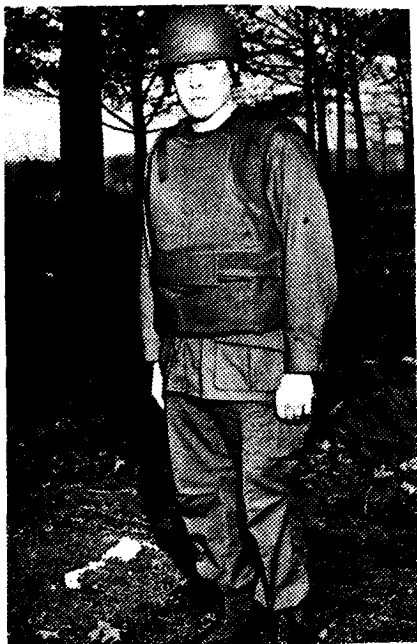


Figure 5-5. Body Armor, Small Arms, Protective: Ground Troops, Front-Back Plate with Vest.

Use: For medical equipment repairman; individual engaged in paint spraying and stripping; individual handling garbage, wet or dirty refuse, wood or metal scrap, chemical, paint or acid containers; individual handling, acids, insecticides, solvents, corrosive materials; individual cleaning tanks containing this type material; individual handling toxic or poisonous material; sand blasting operator, sheet metal worker, finisher and helper for maintenance repair or dust exhaust systems or structural parts of acid, degreasing or paint-stripping solvent vats.

S. COVERALLS, SAFETY, INDUSTRIAL: POLYESTER TAN

Source: LIN F-33121
NSN 8415-00-926-5113 and
NSN 8415-00-936-7879
through 7882 (various sizes)

Use: For individual engaged in NIKE potentiometer rebuild, inspection, or other work requiring dust-free and lint-free clothing.

T. COVERALLS, MEN'S: WHITE, COTTON SATEEN, CARDED 8.8 OZ.

Source: LIN F-32535
NSN 8405-00-082-5529
through 5540

Use: By individual working in areas potentially

or actually contaminated with radiation material, biological material, or other hazardous material where work clothes may not be worn beyond work area; by individual assigned alert crew duty at class A or B Army Airfield; per Department of Nuclear Science.

U. COVERALLS, SAFETY, INDUSTRIAL, FIRE-, OIL-, WATER-, AND CHEMICAL-RESISTANT (fig. 5-6)

A one-piece, treated, cloth overall with open front and breast pocket, no cuffs. Available in several colors.

Source: LIN 81475N



Figure 5-6. Coveralls, Safety, Industrial, Fire-, Oil-, Water-, and Chemical-Resistant.

Use: By personnel working on jobs involving exposure to the hazard of external contact with sparks, molten metal, flames, radiant heat, explosives or flammables, flying particles, cuts, moderate impacts, oils, grease, acid vapor, chemicals, steam, irritating or otherwise hazardous dusts, wet conditions or paint spray. Explosive plant clothing should be fastened with non-metallic fasteners; pockets should be of the lattice type; trouser legs and sleeves should be tapered and without cuffs.

V. DRAWERS, MEN'S, COTTON, THIGH LENGTH, WHITE, ELASTIC WAISTBAND

Source: LIN G-48939

Use: By personnel working in areas potentially or actually contaminated with radioactive, biological, or other hazardous materials. Work clothing must not be worn beyond work area.

W. GUARD, PROTECTIVE CUFF

Fiber, metal, or metal mesh armlets for protection against cuts and abrasions caused by handling very rough, sharp, or jagged objects.

Source: LIN 83361N

Use: By personnel whose arms are insufficiently protected against the hazards of a specific occupation.

X. GUARD, PROTECTIVE: SHIN

A heavy, fiber guard that can be strapped to the lower leg to protect against cuts, flying objects, sparks, and leg bruises.

Source: LIN 83378N

Use: By personnel performing hazardous duty as required for shin protection against cuts, flying chips, impacts, sparks, and knock-against accidents.

Y. GUARD, PROTECTIVE: SHIN AND LEG (fig. 5-7)

A heavy, leather-covered shin and leg guard, reinforced with steel stays.

Source: LIN 83380N

Use: For PM Security, timber cutters, forest rangers, WAB Commanding Officer.



Figure 5-7. Guard, Protective: Shin and Leg.

Z. JACKET, SAFETY, OIL- AND ACID-PROTECTIVE

A heavy rubber, water-resistant jacket with clasp closures, leg length.

Source: LIN 84125N

Use: By personnel on jobs requiring protection of body and clothing from caustics, acids, and various adhering compounds, including such occupations as steam cleaning, dip tank operators, vehicle undercoaters, etc.

AA. LEGGINGS, PROTECTIVE, INDUSTRIAL, KNEE- OR HIP-LENGTH, ACID-, ALKALINE-, OIL-, SOLVENT-RESISTANT

Knee- or hip-length leggings made of synthetic material designed to protect the front of the legs from heat, splash, and moderate impact.

Source: LIN 84651N

Use: Operations requiring leg protection against radiant heat, sparks, flames, hot metal splashes, moderate impact flying objects, acids, alkalis, oil, solvents, etc.; ILO clothing items providing leg protection.

BB. LEGGINGS, PROTECTIVE, INDUSTRIAL, HIP-LENGTH, WATER- AND CHEMICAL-RESISTANT (fig. 5-8)

Hip-length rubber leggings with belt straps, to protect entire leg.

Source: LIN 84656N

Use: Same as item AA above.



Figure 5-8. Leggings, Protective, Industrial Hip-Length, Water- and Chemical-Resistant.

CC. OVERALLS, SAFETY: OIL- AND ACID-PROTECTIVE, BIB-TYPE, INFRA-RED-PROTECTIVE

A general purpose overall, one-piece combination of pants and bib with shoulder straps,

to protect the chest, waist, and lower body from general as well as specific hazards.

Source: LIN 85856N

Use: By personnel ILO protective coveralls, trousers, or other similar protective clothing items, on jobs requiring protection against radiant heat, sparks, flames, specific hazards, metal splash, infrared and/or ultraviolet rays, cuts, flying chips, oil, grease, alkalis, many acids, water salts, chlorinated solvents, etc.

DD. PADS, KNEE, INDUSTRIAL: MOISTURE- AND HEAT-RESISTANT (fig. 5-9)

A set of heavy rubber or leather pads for strapping around the knees to protect them from injury and improve comfort when working for prolonged periods in a kneeling position.

Source: LIN 85906N

Use: By personnel performing tasks in a kneeling position, such as welding or riveting, against prolonged pressure, friction, abrasion, moisture, or heat.

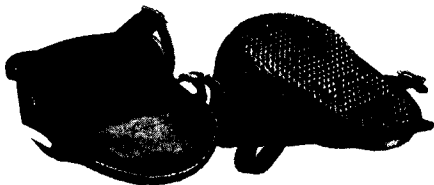


Figure 5-9. Pads, Knee, Industrial: Moisture- and Heat-Resistant.

EE. PARKA, WET WEATHER: WITH FIRE-PROOF EXTERIOR FABRIC, AND WITH REMOVABLE LINER

Source: LIN 85927N

Use: For individual performing ammunition destruction duty when required; to be worn in inclement weather.

FF. PROTECTORS, ARM, EXTENSION TYPE, FOR WRIST PROTECTION (fig. 5-10)

A heavy fiber, metal, or leather protector for the wrist and forearm, with multisnap closure.

Source: LIN 86298N

Use: For installation PM Section WABCO.



Figure 5-10. Protectors, Arm, Extension Type, for Wrist Protection

GG. SHIRT, SAFETY, OIL- AND ACID-PROTECTIVE: FIRE- AND WATER-RESISTANT

Man's shirt made of dacron, dynel, or orlon and worn in combination with matching trousers.

Source: LIN 87205N

(Also see Trousers: LIN 88265N.)

Use: By personnel, ILO protective overalls, coveralls, or similar protective clothing items for the same purpose, or jobs requiring protection against one or a combination of the following hazards: radiant heat, sparks, flame, water, oil, grease, acids, alkalis, cuts, abrasions, minor impacts, metal splash, etc., such as washers, degreasers, machinists, oilers, chemical manufacturing laboratory workers, field test personnel working around chemicals and toxicants, and equipment operators in inclement weather WAB installation commanders.

HH. SLEEVE, CAPE, AND BIB WELDERS: FLAMEPROOF (fig. 5-11)

A leather cape sleeve with snap buttons in front for quick removal. Provides complete upper body protection, including chest and back.

Source: LIN 87621N

Use: By personnel on jobs requiring protection against sparks, flames, radiant heat, flying coarse abrasive objects, etc., ILO other protective clothing for the same purpose.



Figure 5-11. Sleeve, Cape, and Bib Welders: Flameproof.

II. SUIT, UTILITY

Nylon, vinyl-coated both sides, and highly resistant to oils, acids, cold, and heat.

Source: Appendix A

Use: Where protective clothing is needed. Can be decontaminated after each use.

JJ. TRAINER, DOG ATTACK

An ensemble consisting of trousers, jacket, sleeves, and cuffs. The sleeves and cuffs are detachable and permit economical replacement of that part of the ensemble most often damaged.

Source: NSN 8415-00-268-8134

Use: By dog trainers and personnel handling dangerous or vicious laboratory animals.

KK. COAT, DOG ATTACK TRAINING

A special 3-ply duck and burlap jacket for dog attack training. Includes two sleeves and two cuffs.

Source: LIN E-43371

NSN 8415-00-616-0165

LL. CUFF, DOG ATTACK TRAINING

A special 2-ply outer burlap cuff covering fingertips to elbow for use over Sleeve, Dog Attack Training.

Source: LIN F-53543

NSN 8415-00-616-0164

MM. SLEEVE, DOG ATTACK TRAINING

A special 3-ply duck and burlap sleeve with laces for attaching to Coat, Dog Attack Training.

Source: LIN T-72252

NSN 8415-00-616-0163

NN. TROUSERS, DOG ATTACK TRAINING

A special 3-ply duck and burlap pair of trousers with padding extending from instep to crotch in front and heel to buttocks in back, with suspenders.

Source: LIN X-35399

NSN 8415-00-616-0162

OO. TROUSERS, SAFETY: OIL AND ACID PROTECTIVE, FIRE AND WATER RESISTANT (fig. 5-12)

Trousers made of dacron, dynel, or orlon

and worn with matching shirt. (See Shirt, Safety, LIN 87205N.)

Source: LIN 88265N

Use: By personnel ILO protective coveralls, overalls or similar protective clothing items for the same purpose. Provide protection against heat, oil, grease, acids, alkalis, cuts, abrasions, minor impacts, etc. Available in several colors. Occupations: washers, degreasers, machinists, oilers, chemical workers, acid handlers, chemical manufacturing, laboratory workers, field test personnel working around chemicals and toxicants, and equipment operators in inclement weather WAB installation commanders.



Figure 5-12. Trousers, Safety.

Limitation: This shirt-trouser combination is intended to protect against minor hazards of small splashes or drops of corrosive liquids or oils. When the hazard is more severe, care should be taken to utilize garments providing adequate protection against the specific hazard; i.e., chemical-resistant rubber or plastic for acids, alkalis or other chemicals; asbestos, leather, or fiberglass for heat protection; wire mesh or reinforced leather to protect against edged tools. Leather-lead, fiber-lead, or rubber-lead clothing

should be used to provide protection from X-rays and beta radiation.

PP. UNDERSHIRT, MAN'S, COTTON

A white pullover type undershirt with U-neck and quarter length sleeves.

Source: LIN X-86702

NSN 8420-00-543-6643 through 6650
(various sizes)

Use: By personnel working in area potentially or actually contaminated with radioactive, biological and/or other hazardous materials where work clothing must not be worn beyond work area.

5-4 MAINTENANCE, LAUNDERING, AND FITTING INSTRUCTIONS

5-4.1 MAINTENANCE

The development of the newer synthetic fibers has resulted in better worker comfort and in clothing that resists the rapid deterioration heretofore experienced with the conventionally made clothing of natural fibers.

Although the synthetic fibers have many good characteristics, they also have their limitations and should be used with caution in certain occupations.

5-4.2 CHEMICAL PROTECTION

Dacron, dynel, and orlon cloth offers good resistance to moderate concentrations of acids and caustics. However, it is intended to protect against the minor hazards of small splashes, or drops of corrosive liquids. When the hazard is more severe, such as the possibility of gross spillage or splashing, hoods, aprons, and gloves made of chemically-resistant rubber or plastic should be worn.

5-4.3 EXPLOSIVES

Synthetic fibers do not absorb moisture very readily; therefore, they tend to retain larger

charges of static electricity as compared to cotton under the same conditions.

Personnel assigned to work in explosive atmospheres should not be issued clothing made of synthetics such as nylon.

5-4.4 FIRE RESISTANCE

Cotton clothing in itself is not fire-resistant, and many of the fire-resistant treatments for cotton cloth that are commercially available have been found to be deficient in one or more of the following characteristics:

- (1) Laundering reduces or removes fire-resistance properties.
- (2) Stiffness of fabric is increased.
- (3) Fabric is weakened in processing or after a relatively short period of use.
- (4) Causes dermatitis or other toxic effects.

The synthetic fibers, such as rayon, acetate, nylon, orlon, and dacron, offer about the same fire-resistance as cotton; however, they have a tendency to melt at certain temperatures, thereby creating a hazard to the wearer.

Dynel in its raw state is self-extinguishing; i.e., it will not continue to burn when the flame is removed. However, dyes and finishing have a tendency to adversely affect self-extinguishment.

5-4.5 LAUNDERING

Clothing made of a synthetic fabric is usually labeled with the manufacturer's instructions for laundering, drying, and pressing. In the event such instructions are missing, follow the procedures for silks and rayons — moderately cool washing, drying, and pressing temperatures.

5-4.6 FITTING INSTRUCTIONS

Safety clothing has been designed to provide the utmost in protection, maneuverability, durability, adaptability, and serviceability. To take advantage of these physical characteristics it is essential that it fit properly. Fitting instructions are given in TM 700-8400-1, "Fitting of Uniform." Changes 1, 3.

CHAPTER 6. PROTECTIVE FOOTWEAR

6-1 INTRODUCTION

Injuries to the foot are painful and may result in prolonged temporary or permanent disability. Probably no piece of safety equipment is needed by more workers more of the time than is protective footwear. No shoe or boot can be called "safe" unless it provides adequate protection from the hazard or combination of hazards likely to be encountered on any job. Where the hazards are recognized and dramatized in a Safety Footwear Program, great strides can be made in foot protection with a consequent reduction in painful, crippling, and costly foot injuries.

Protective footwear is available in a wide range of types, models, and materials for different applications. Selection of the proper type is extremely important if adequate protection is to be provided.

Rubber boots or overshoes will protect against water, mud, oil, grease, acid, and chemicals. If the work requires the handling of heavy objects or materials that might fall and injure the feet, steel-toed safety shoes or foot guards, or both, should be worn. To protect the upper part of the foot, metatarsal guards should be worn in conjunction with safety shoes.

For foundry work or other operations involving hot metal, or where acid spills might occur, "Congress" or gaiter type shoes are best. These styles have no fasteners and can be quickly and easily removed in an emergency.

Specially-fabricated shoes with conductive and/or sparkproof soles and heels are available for use in hazardous areas where static or friction sparks might ignite explosive concentrations of dust or flammable gases or vapors. Shoes with insulated soles are used by electricians and others to guard against electrical shock.

Detachable foot guards may be used where severe crushing or impact hazards exist. Spats, chaps, leggings, etc., represent auxiliary items that can be used to provide added protection to the lower extremities when warranted by specific job conditions.

It is DA policy that all civilian employees and military personnel exposed to industrial haz-

ards peculiar to their occupational specialty be furnished safety shoes at Government expense. Therefore, Commanders may procure standard safety shoes, as personal property, from the central supply system. In cases where the standard safety shoe is unacceptable, local purchases may be authorized. Cost of such procurement will be absorbed within the local current-funding program. To insure that appropriate safety footwear are authorized, the installation safety officer should evaluate and approve each type of safety shoe utilized by personnel assigned to his organization.

Reference: CTA 50-900, note 72

A nonstandard, commercial-type, conductive shoe is authorized for use by those individuals assigned duties involving contact with, or working around, explosives.

Reference: CTA 50-900, note 90

NOTE: For Tester Shoe Conductivity, see chapter 13.

6-1.1 SPECIAL PURPOSE PROTECTIVE BODY CLOTHING, ENSEMBLES, AND SUITS FOR FOOT PROTECTION – CROSS REFERENCE

Boot Fireman — Chapter 14

Cold Weather Conditions — Chapter 15

Ensemble Aluminum Asbestos Fire Fighters Clothing — Chapter 14

Ensemble Rocket Fuel Handlers Full and Limited Protection — Chapter 17

Ensemble Toxicological Agents Protective — Chapter 10

Handlers of Chemical Agents

(1) Clothing Outfit Chemical Protective — Chapter 11

(2) Suit Chemical Protective — Chapter 11
Handlers of Toxic Chemical Agents — Protective Outfit Impermeable Supplied Air, M5 — Chapter 11

Handlers of Vesicant Gases — Chapter 11

Lineman, Electrical — Chapter 13

Nuclear Radiation Protective (Apron, Boots, Coveralls, Gloves, and Sleeves) — Chapter 16

Shoe Safety Conductive Sole — Chapter 14
Suit, Rescue Acid — Chapter 11
Suit, Tear-off — Chapter 14

6-2 SPECIFIC ITEMS OF PROTECTIVE FOOTWEAR

A. ANKLETS, WOMEN'S: COTTON, HEAVY WEIGHT

Source: LIN 80253N

Use: By female working in biological laboratory.

B. BOOTS, CLIMBER'S: BLUCHER STYLE, STEEL BOX TOE, LEATHER, BLACK, 9 IN.

Source: LIN C-08871

NSN 8430-00-135-2672 through 2731

NSN 8430-00-495-1386 through 1431

Use: Per individual where assigned duty requires use on poles and towers for extended periods. A prerequisite for EM in Air Training Command course.

C. BOOTS, COMBAT: MEN'S, LEATHER, BLACK, 10 ½ IN. HIGH, FOR ORTHOPEDIC USE (fig. 6-1)

Source: LIN C-06886

NSN 8430-00-782-3555

(various sizes, chapter 8 - SB700-20)

Use: Per male individual ILO LIN C-06749 or C-07740 who requires orthopedic corrections to his footwear.



Figure 6-1. Boots, Combat: Men's, Leather, Black, 10 ½ in. High, for Orthopedic Use.

D. BOOTS, COMBAT: MEN'S, LEATHER, BLACK, MILDEW RESISTANT, DMS, 10 ½ HIGH (fig. 6-2)

Source: LIN C-06749

NSN 8430-00-186-6826

through 7098 (various sizes)

NSN 8430-00-242-5014 (size 4-½ W)

NSN 8430-00-782-3077

through 3131 (various sizes)

Use: By male military personnel.



Figure 6-2. Boots, Combat: Men's, Leather, Black, Mildew Resistant, DMS, 10 ½ High.

E. BOOTS, COMBAT: WOMEN'S, LEATHER, BLACK, MILDEW RESISTANT (fig. 6-3)

Source: LIN C-08941

NSN 8435-00-082-2194 through 2293

Use: By female military personnel.



Figure 6-3. Boots, Combat: Women's, Leather, Black, Mildew Resistant.

F. BOOTS, HIP: MEN'S, RUBBER, BLACK (fig. 6-4)

A black rubber, hip-length boot.

Source: LIN C-07845

NSN 8430-00-241-2775 through 2783

NSN 8430-00-241-2904 and 2905

(various sizes)

Use: Street cleaning, vehicle washing, sewer repairing, spraying, steaming, washout operations, amphibious operations, bridge construction, etc.

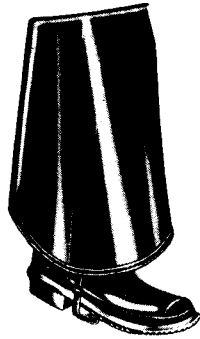


Figure 6-4. Boots, Hip: Men's, Rubber, Black.

G. BOOTS, HIP, OIL RESISTANT

A black neoprene rubber boot providing solvent, oil, and grease resistance.

Source: LIN 80591N

Use: When footwear is exposed to solvents, oil, or grease, etc., which are destructive to boots or rubber composition.

H. BOOTS, KNEE: MEN'S, RUBBER, BLACK, CLEATED SOLE AND HEEL (fig. 6-5)

A black rubber, knee-length boot with cleated sole and heel.

Source: LIN C-08530

NSN 8430-00-262-8252 through 8261

NSN 8430-00-262-8278

Use: Around steam cleaning equipment, handling of GM fuels, plating or washout operations, missile sites, outdoor storage facilities, and any wet or muddy area. Also see Ensemble Rocket Fuel Handlers Full and Limited Protection - chapter 17.



Figure 6-5. Boots, Knee: Men's Rubber, Black, Cleated Sole and Heel.

I. BOOTS, SAFETY: KNEE, RUBBER WITH SAFETY TOE AND STEEL SHANK (fig. 6-6)

Has safety toe and removable safety inner-sole.

Source: LIN 80601N

Use: In wet or muddy areas where hazard from heavy objects falling on toes also exists.



Figure 6-6. Boots, Safety: Knee, Rubber with Safety Toe and Steel Shank.

J. BOOTS, SAFETY: NONMARKING SOLE AND HEEL, NONCONDUCTIVE, 8 IN.

Source: LIN 80603N

Use: Per individual assigned work involving repair of electric and heating appliances, welding, plumbing, and other duties requiring protection from electric shock.

K. BOOTS, SAFETY: 8 IN., STEEL CAP AND TOE, NEOPRENE SOLE AND HEELS

Source: LIN 80609N

Use: Per individual assigned duty such as operation of heavy equipment engaged in ground maintenance work and exposed to hazards that cannot be protected by standard safety shoes or combat boots.

L. BOOTS, TOXICOLOGICAL AGENTS PROTECTIVE (TAP)

Source: LIN C-08804
NSN 8430-00-820-6259 through 6306
(various sizes)

Use: See Ensemble, Toxicological Agents Protective (TAP), chapter 10.

M. GUARD, PROTECTIVE FOOT (fig. 6-7)

A hard fiber or metal shield worn over the shoe to provide additional protection to the toes and/or instep from heavy falling objects.

Source: LIN 83366N

Use: To improve protection afforded by safety shoes, or to protect against heavy falling objects, punctures, cuts, or abrasions when safety shoes are not worn.



Figure 6-7. Guard, Protective Foot.

N. OVERSHOES, MEN'S: RUBBER, HIGH-CLEATED, 5 BUCKLE

Source: LIN N-39848
NSN 8430-00-144-1640 through 1650
(various sizes)

Use: By individual NOA working in wet or muddy areas or in cold storage plant, warehouse or frozen food locker; powder handler; washout operator; ammunition renovator; automobile radiator repairman; street cleaner NOA rubber knee boot for this purpose.

O. OVERSHOES, MEN'S: HIGH, NONSKID SOLE, 5 BUCKLE

Source: LIN N-39985
NSN 8430-00-144-1672 through 1682
(various sizes)

Use: By individuals performing port/ship/barge security or river patrol; duty involving waterborne or amphibious operations.

NOTE: See CTA 50-900, Note 47, for applicable teams.

P. OVERSHOES: NYLON, WHITE, LINT-AND DUST-FREE

A white nylon foot covering with drawstrings.

Source: LIN 85876N

Use: Where dust-free and lint-free operations are required, such as precision instrument maintenance areas, clean rooms, etc.

Q. OVERSHOES, WOMEN'S: ANKLE HEIGHT, GRAY VINYL PLASTIC

Source: LIN N-40122
NSN 8435-00-823-7165 through 7173
(various sizes)

Use: Per female individual.

R. OVERSHOES, WOMEN'S: HIGH, BLACK VINYL PLASTIC (fig. 6-8)

Source: LIN N-40396
NSN 8435-00-082-2333 through 2341
(various sizes)

Use: Per female individual.

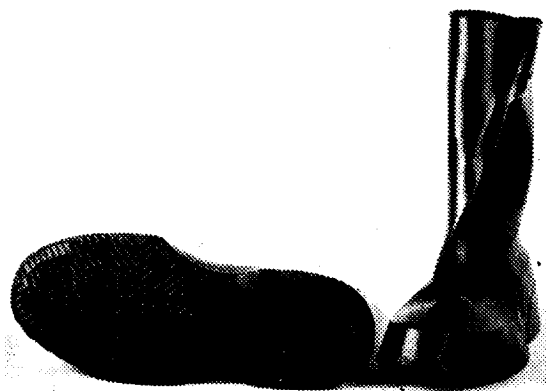


Figure 6-8. Overshoes, Women's: High, Black Vinyl Plastic.

S. SANDAL: STRAP-ON (fig. 6-9)

A wooden sandal, either solid or hinged, which is strapped onto the bottom of regular shoes.

Source: LIN 87112N

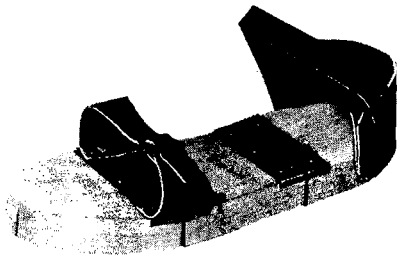


Figure 6-9. Sandal: Strap-on.

Use: For protection against chemicals, caustics, and sharp objects underfoot.

T. SAFETY INSOLES

An insert for any boot or shoe consisting of overlapping stainless steel plates sandwiched between rubberized fabric plies.

Source: Appendix A

Use: Protects feet from cuts and puncture injuries from nails, spikes, or other sharp objects.

NOTE: Order one size smaller than shoe size.

U. SHOES, GREEN, CONDUCTIVE CANVAS, NONSKID SOLE

Source: LIN 87228N

Use: Per individual working in hospital environment using anesthetic gases when conductive footwear is required to contain static electricity.

V. SHOES, NONSPARKING: HIGH BLUCHER, LEATHER

A high-top leather shoe with neoprene sole, safety toe, mildew resistant.

Source: LIN T-07856

NSN 8430-00-753-5694

NSN 8430-00-753-5699

NSN 8430-00-753-5713

NSN 8430-00-753-5722

NSN 8430-00-753-5723

NSN 8430-00-753-5740 through 5743

NSN 8430-00-753-5745

NSN 8430-00-753-5756

NSN 8430-00-753-5757 (various sizes)

Use: General work where toes are exposed to injury from heavy falling objects.

Limitation: Not suitable where metatarsal protection required, or where high degree of hazard from static discharge exists.

W. SHOES, MOLDER'S: HIGH, CONGRESS, LEATHER, NONMARKING SOLE, SAFETY TOE

Source: LIN T-07933

NSN 8430-00-926-9965 through 9974
(various sizes)

Use: Per civilian employee assigned jobs involving handling large, heavy objects or who work around hot metal such as in foundry work.

X. SHOES, NONSPARKING: TRACTION TREAD SOLE AND HEEL, MILDEW RESISTANT (fig. 6-10)

Source: LIN T-08472

NSN - See SB 700-20 (many sizes)

Use: By mechanics and mechanic helpers, male individual stationed aboard floating maintenance facility; male individual assigned work involving contact with oil or dilute acid, as well as exposing the feet to possible injury from heavy falling objects; individual in chemical technical escort detachment; individual performing chemical work involved with H-gas.



Figure 6-10. Shoes, Nonsparking: Traction Tread Sole and Heel, Mildew Resistant.

Y. SHOES, RUBBER, SAFETY TOE

A high top, rubber, safety shoes, blucher type with steel safety toe.

Source: LIN 87258N

Use: In biological laboratory, WAB by BW research project officer, or on operations involving

WP and PWP (style and type to meet specific job requirements), or where toes are exposed to injury from falling objects.

Z. SHOES, SAFETY: CLOG, CONDUCTIVE

A sandal type shoe with fabric straps and special composition sole for dissipating static charges.

Source: LIN 87231N

Use: Work involving short-term exposure to acids, explosives, or in hospital operating rooms where explosive anesthetics are being used, or anyplace where static discharge presents a problem.

AA. SHOES, SAFETY: INDUSTRIAL

A rubber shoe with steel toe and shock-proof insole; has tread design outsole for traction.

Source: LIN 87237N

Use: Where protection is needed against oil and acid splash plus hazard of heavy falling objects such as in chemical manufacturing operations, in phosphate development work, etc.

BB. SHOES, SAFETY: OIL AND ACID PROTECTIVE, NONSPARKING, SAFETY TOE (fig. 6-11)

An oxford style shoe with safety toe and nonsparking composition rubber sole.

Source: LIN 87248N (men's)
LIN 87250N (women's)

Use: Work involving contact with oil, dilute acid, or explosives, and where hazard of heavy falling objects also exists, such as in warehouse or maintenance operations, construction work, rigging, material handling, explosives handling in magazines, etc.

CC. SHOES, SAFETY, OIL AND ACID PROTECTIVE

A russet leather shoe with conductive sole; mildew resistant.

Source: LIN 87244N

Use: Areas where static sparks might cause an explosion, such as spray painting, gas handling, ammunition breakdown operations, or maintenance work where explosive gases or vapors are present.



Figure 6-11. Shoes, Safety: Oil and Acid Protective, Nonsparking, Safety Toe.

NOTE: To effectively drain off static charges, surface in contact with shoes must also be conductive and grounded.

DD. SHOES, SHOWER, WOODEN

A wood clog with heavy, 3-inch straps.

Source: LIN 87292N

Use: In showers, washrooms, locker rooms, and swimming pool areas; to prevent foot infections.

EE. SOCKS, MEN'S: COTTON-NYLON, BLACK SHADE, 94 STRETCH

Source: LIN T-92171
NSN 8440-00-543-7773 through 7775
NSN 8440-00-993-8672 (extra large)

Use: By personnel working in area potentially or actually contaminated with radiation material, biological material, and other hazardous material when item must not be worn beyond work area.

FF. SOCKS, MEN'S: 25% COTTON, 75% WOOL NATURAL

Source: LIN T-92719
NSN 8440-00-153-6717 through 6721
(various sizes)

Use: By engineer diver; by male individual issued Boot Ski LIN 2-09063, Zones V through VII.

GG. SPAT: PROTECTIVE (fig. 6-12)

Aluminized asbestos spats for covering foot and ankle, with strap closures at ankle, heel, and instep.

Source: Appendix A

Use: For temporary duty around welding, torch cutting, blacksmithing, or sheet metal work where protection against burns and cuts is required.



Figure 6-12. Spat: Protective.

6-3 AMERICAN NATIONAL STANDARDS INSTITUTE STANDARD FOR MEN'S SAFETY TOE FOOTWEAR (ANSI Z41.1-1967(R1972)).*

IDENTIFICATION

Identifying Footwear. When classified according to Performance Requirements, at least one of each pair of footwear shall be clearly and legibly stamped as detailed below.

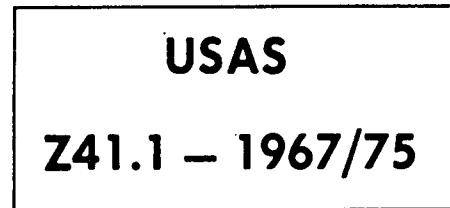
Location of Identification Mark. The stamp may be placed on the inside quarter, or the shank of the outsole, shank of the insole, or tongue, and shall be enclosed in a border.

Wording of Identification. The identification shall read as follows (no change or substitution of wording is permissible):

- (1) USAS followed by the designation
Z41.1-1967/75 (2,500 compression pounds, 75 Impact, foot pounds)
Z41.1-1967/50 (2,500 compression pounds, 50 Impact, foot pounds)
Z41.1-1967/30 (2,500 compression pounds, 30 Impact, foot pounds)
Depending on the results of impact and compression testing.
- (2) Numbers and letters shall be 3/16 inch tall or taller.

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Example:



6-4 MAINTENANCE AND FITTING INSTRUCTIONS

Maintenance. Soiled shoes should be cleaned with saddle soap and wiped dry. Wet shoes should be dried at room temperature and never placed near a fire or hot radiator. To retain shape and to prevent shrinkage, shoe trees should be utilized. If trees are not available, footwear should be stuffed firmly with paper. The leather can be preserved and made more water repellant and mildew resistant by application of water and mildew repellants.

Fitting. Footwear, improperly fitted, can cause foot ailments, thereby affecting the health, morale, and efficiency of the wearer. Proper fitting instructions are provided in Technical Manual TM 10-228 "Fitting of Footwear." Trained personnel only should be authorized to issue footwear.

Conductive Shoes. Conductive or nonsparking shoes are worn to prevent the formation of static electrical charges on the body. To prevent static buildup, it is necessary that the resistance of each shoe not exceed 450,000 ohms.

The resistance of shoes may be determined by use of a resistance meter. Military Specification MIL-S-3794 describes the test methods.

If the use of a resistance meter indicates that, because of the accumulation of dirt and oils on the soles, the resistance is higher than 450,000 ohms, the shoes should be cleaned and retested. If the resistance is not lowered to less than 450,000 ohms, the shoes should no longer be worn for their original purpose.

NOTE: Careful consideration should be given to the degree of hazard to the toes present in the working environment before employing shoes having an ANSI Z41.1-1967 performance classification of less than 75.

CHAPTER 7. PROTECTIVE HANDWEAR

7-1 INTRODUCTION

The human hand is one of the most versatile and valuable "tools" available to industrial workers and Armed Forces personnel. At the same time, it is one of the parts of the body that is most susceptible to injury.

Because of its importance, much effort has been expended in developing handwear to protect the hands and fingers from injury or infection. Protective handwear is now available in a wide variety of materials and styles, many of which are designed for specific purposes.

General purpose gloves are made of cloth (usually cotton) or canvas and may have either band, knit, or gauntlet wrists. Palms and fingers may be reinforced for additional wear, sometimes with metal stitching or facing if there is severe exposure to cuts or edged tools. Leather is used for exceptionally rough or heavy work, but will not stand temperatures above 150°F. Steel mesh gloves are used in butchering and meat cutting operations to protect against cuts.

Rubber gloves of various types are available for protection against acids, caustics, and other chemicals, oils, and solvents. Specially designed rubber gloves are used to protect against electrical shock. Such gloves are tested individually for dielectric strength at the time of manufacture, and should be retested at regular intervals to make certain they do not lose their insulating properties.

For protection against flame, sparks, radiant heat, or hot objects, asbestos gloves and mittens, wool-lined and aluminized, are available. Plastic-coated gloves provide good service and protection against steam, water, acids, and caustics. Handleathers or hand pads are sometimes used for handling highly abrasive or splintery materials, as they can be made rather heavy without sacrificing dexterity. Finger cots or stalls are used on specific abrasive operations where full hand protection is not necessary or desirable. To prevent injury to the most important "tools" of any job, your hands, select from the items below the most appropriate handwear to protect against the hazards involved in your particular tasks.

7-1.1 SPECIAL PURPOSE PROTECTIVE BODY CLOTHING, ENSEMBLES, AND SUITS – FOR HAND PROTECTION – CROSS REFERENCE:

- Aviation – Chapter 9
- Ensemble, Aluminum Asbestos, Fire Fighter's Clothing – Chapter 14
- Ensemble, Rocket Fuel Handlers, Full and Limited Protection – Chapter 17
- Ensemble, Toxicological Agents, Protective – Chapter 10
- Ensemble, Trainer, Dog Attack – Chapter 5
- Extreme Temperature and Weather Conditions – Chapter 15
- Glove Box – Chapter 10
- Gloves, Synthetic, Arm Length – Chapter 10
- Gloves, X-Ray Protective – Chapter 16
- Handlers of Chemical Agents
 - (1) Clothing Outfit, Chemical Protective – Chapter 11
 - (2) Suit, Chemical Protective – Chapter 11
- Handlers of Toxic Chemical Agents – Protective Outfit, Impermeable, Supplied Air, MB – Chapter 11
- Handlers of Vesicant Gases – Chapter 11
- Lineman, Electrical – Chapter 13
- Nuclear Radiation Protective (Apron, Boots, Coveralls, Gloves, and Sleeves) – Chapter 16
- Suit, Radiation Hazard, Disposable – Chapter 16
- Suit, Switchers, Electrical – Chapter 13
- Suit, Tear-off, Handlers of Aluminum Alkyls and Other Similar Products – Chapter 14
- Welders – Chapter 14

7-2 SPECIFIC ITEMS OF PROTECTIVE HANDWEAR

A. GLOVES, BARBED TAPE-WIRE HANDLERS: MEN'S, COWHIDE, GAUNTLET CUFF

Source: LIN J-63886
NSN 8415-00-926-1674

Use: Barbed wire handler NOA; student engineer school; ordnance training company; company, battery, or troop NOA; armored or infantry engineer battalion; assembly and transport platoon, FA rocket battalion.

B. GLOVES, CLOTH: CANTON FLANNEL, LATEX-COATED, WATERPROOF, GAUNTLET CUFF (fig. 7-1)

Canton flannel gloves coated with latex or synthetic rubber; waterproof, and has gauntlet cuff.

Source: LIN 82883N

Use: By personnel handling frozen food and meats in cold storage plants, or on any job where it is necessary to protect the hands against cold.



Figure 7-1. Gloves, Cloth: Canton Flannel, Latex-Coated, Waterproof, Gauntlet Cuff.

C. GLOVES, CLOTH: MEN'S, NATURAL ASBESTOS (fig. 7-2)

A lined, asbestos glove with gauntlet cuff, natural color, for general work where hot material must be handled.

Source: LIN J-65598
NSN 8415-00-261-7015

Use: Where protection of hands and forearms is required from flame, sparks, hot metal, or other sources of heat, such as in a blacksmith shop, foundry, white phosphorous ammunitions handling, primer-fixing personnel, etc.



Figure 7-2. Gloves, Cloth: Men's, Natural Asbestos.

Limitation: Should not be worn around moving machinery.

D. GLOVES, CLOTH: MEN'S, NATURAL

A cotton work glove, cotton flannel, with knit cuff.

Source: LIN J-65461
NSN 8415-00-268-8330

Use: For protection against rough or sharp surfaces.

Limitation: Should not be worn around moving machinery.

E. GLOVES, CLOTH: WOMEN'S, WORK, COTTON FLANNEL, NATURAL

Source: LIN J-66146
NSN 8415-00-268-8341

Use: For protection against rough or sharp surfaces.

F. GLOVES, CLOTH: WORK-TYPE

A cotton knit glove with leather palm for use in cold temperatures.

Source: LIN J-66420
NSN 8415-00-227-1220 through 1222
(various sizes)

Use: For work requiring adjustment of instruments or similar duty in extremely cold temperatures.

Limitation: Should not be worn around moving machinery.

G. GLOVES, CLOTH: WORK-TYPE, COTTON KNIT, OG109, UNTREATED (fig. 7-3)

Source: LIN J-66626
NSN 8415-00-964-4615 Small
NSN 8415-00-964-4760 Medium
NSN 8415-00-964-4925 Large

Use: Per individual in NIKE-HERCULES radio-logical monitoring team.

H. GLOVES, CLOTH: COTTON, WHITE, FILM HANDLERS

A cotton work glove providing snug fit for maximum dexterity.

Source: LIN J-64639
NSN 8415-00-268-8353 Medium
NSN 8415-00-268-8354 Small



Figure 7-3. Gloves, Cloth: Work-Type, Cotton Knit, OG109, Untreated.

Use: By film handlers or film library employees, personnel assembling small hardware or parts, or by meat cutters (worn as insert under wire mesh gloves).

Limitation: Should not be worn around moving machinery.

I. GLOVES, LATEX, SURGICAL

A lightweight, natural latex, amber-colored glove, available in various sizes.

Source: Appendix A

Use: For use in medical, chemical, or biological laboratories for protection against irritants, such as weak acids and bases.

J. GLOVES, LEATHER: GAUNTLET CUFF, BARBED WIRE

Cowhide or horsehide gloves with gauntlet cuff and reinforced palm.

Source: LIN J-67653

NSN 8415-00-268-7873

Use: By personnel handling barbed wire, sheet metal, glass, etc., to prevent cuts and punctures of the hands.

Limitation: Will deteriorate rapidly at temperatures over 150°F.

K. GLOVES, LEATHER: HEAVY LEATHER, STEEL SEWED

A heavy leather glove reinforced with steel stitching.

Source: LIN 82896N

Use: For animal handling in experimental laboratories or animal training; also for handling rough castings, forging machine parts, etc.

Limitation: Not to be used around electrical equipment. Will deteriorate rapidly at temperatures over 150°F.

L. GLOVES, CLOTH: LEATHER PALM GAUNTLET

Cotton, work-type gloves with leather palms and knit cuff or gauntlet.

Source: LIN J-65187

NSN 8415-00-268-8349

Use: For protection against rough or sharp surfaces or injurious irritants, such as encountered by laborers, packers, heat treaters, painters, sheet metal workers, riggers, forklift truck operators, trash handlers, etc.

Limitation: Should not be worn around moving machinery.

M. GLOVES, LEATHER: REINFORCED WITH STEEL PALM AND FINGERS, GAUNTLET TYPE (fig. 7-4)

A chrome-leather, gauntlet-type glove with palm and fingers reinforced with steel ribbons and steel stitched.

Source: LIN 82901N

Use: For heavy work requiring extreme protection against sharp or rough edges, such as heavy grinding, sheet metal handling, barbed wire handling, rough forging handling, etc.

Limitation: Should not be used around electrical equipment. Will deteriorate rapidly at temperatures over 150°F.

N. GLOVES, LEATHER: STRAP CLOSURE, CREAM, M1950

Source: LIN J-68064

NSN 8415-00-268-7868 (size 5)

NSN 8415-00-268-7870 (size 4)

Use: General purpose heavy work, such as



Figure 7-4. Gloves, Leather: Reinforced with Steel Palm and Fingers, Gauntlet Type.

general laborers, mill workers, truck drivers, trackmen, riggers, MHE personnel, sheet metal workers, masons, blacksmiths, and construction workers.

Limitation: Will deteriorate rapidly at temperatures over 150°F.

O. GLOVES, LEATHER: WORK-TYPE, GOATSKIN, SNUG FITTING

A lightweight, protective glove with safety cuff for use by both men and women on jobs requiring finger dexterity.

Source: LIN 82905N

Use: For work requiring protection against sharp edges when working with small hardware items or automotive parts. Also by personnel assigned to shoe-last repair or fabrication of boxes.

Limitation: Should not be worn around moving machinery.

P. GLOVES: PLASTIC-COATED, IMPERMEABLE, GAUNTLET CUFF, OIL AND ACID RESISTANT (fig. 7-5)

Source: LIN 82910N

Use: By personnel working with live steam, water, acids, or caustics, where protection is required against burns, irritation, and dermatosis, such as steam cleaning, sandblasting, and operations where oil is an irritant.



Figure 7-5. Gloves: Plastic-Coated, Impermeable, Gauntlet Cuff, Oil and Acid Resistant.

Q. GLOVES, RUBBER: ACID AND ALKALI RESISTANT, BLACK, TYPE I

A pliable synthetic rubber glove, medium weight, black, for general industrial and laboratory applications.

Source: LIN J-69160

NSN 8415-00-266-8673 (size 12)

NSN 8415-00-266-8675 (size 11)

NSN 8415-00-266-8677 (size 10)

NSN 8415-00-266-8679 (size 9)

Use: For protection against acids, water, oil, grease, rust removers, alkalis, salts, chlorinated solvents, and other toxic materials.

Limitation: Not to be used for electrical protection.

R. GLOVES, RUBBER: AROMATIC, FUEL-RESISTANT, BLACK, TYPE II

A heavy weight rubber glove, aromatic fuel resistant, 14 inches long.

Source: LIN J-69434

NSN 8415-00-641-4601 (size 11)

Use: By battery workers to protect against irritants of aromatic fuels.

Limitation: Should not be used for electrical protection.

S. GLOVES, RUBBER, GAUNTLET (fig. 7-6)

A neoprene rubber glove with gauntlet for general use.

Source: Appendix A

Use: For work requiring protection against oil, rust removers, commercial solvents, cleaning compounds, etc., such as in white phosphorous research operations, ammunition processing, and general laboratory work.



Figure 7-6. Gloves, Rubber, Gauntlet.

T. GLOVES, RUBBER: ORGANIC, SOLVENT-RESISTANT, TYPE III

A neoprene rubber glove with rolled edge cuff, 14 inches long, black.

Source: LIN J-69845

NSN 8415-00-823-7455 through 7457
(various sizes)

Use: For protection against organic solvents, steam, or hot water.

Limitation: Should not be used for electrical protection.

U. GLOVES, WIRE MESH: MEAT CUTTER'S

A flexible, metal mesh glove that covers the entire hand and affords protection against knives or other sharp-edged tools.

Source: LIN J-63817

NSN 8415-00-292-9229 through 9231
NSN 8415-00-292-9235 through 9237
NSN 8415-00-685-4959 through 4960
(various sizes)

Use: By meat cutters for protection against cuts and punctures.

V. GUARD, PROTECTIVE: THREE-FINGER, LEATHER, PUNCH PRESS

A steel-reinforced leather guard in 3-finger combinations to protect the fingers from cuts or abrasions.

Source: LIN 83383N

Use: By punch press operators to protect fingers when handling sheet metal or formed metal parts.

W. MITTENS, CLOTH, ASBESTOS (fig. 7-7)

An asbestos mitten with wool lining, gauntlet cuff.

Source: LIN M-53377

NSN 8415-00-266-8843

Use: For handling hot molds or other hot objects by welders, blacksmiths, heat-treaters, furnace operators, type casters in printing plants, assayers, and assayers' helpers.



Figure 7-7. Mittens, Cloth, Asbestos.

X. STALL: FINGER, LEATHER (fig. 7-8)

A leather covering that slips over one finger to protect against cuts, blisters, or abrasions.

Source: LIN 87696N

Use: For workers requiring protection against finger cuts, such as machine operators.

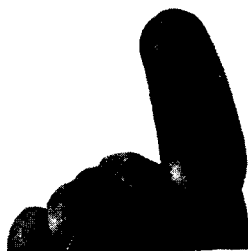


Figure 7-8. Stall: Finger, Leather.

7-3 MAINTENANCE OF HANDWEAR

Because the hand is one of the parts of the body that is most susceptible to injury, it is important that personnel be instructed to obtain a new pair of gloves when theirs have become frayed, worn, or torn. This is especially true for personnel engaged in electrical, biological, chemical, and radiation occupations.

The susceptibility of rubber to tears, punctures, and rapid deterioration makes it essential that they be examined after each use. If in general storage, they should be examined prior to issue. To test for cracks and punctures, inflate the glove by rolling back the edges of the

cuff several turns and blow into the glove. Hold tight to prevent deflation and immerse the inflated glove in water to check for leaks. Bubbles will show the presence and location of pin-point holes. Rubber gloves showing the presence of holes should be discarded.

CHAPTER 8. SAFETY BELTS, LIFELINES, AND LIFESAVING EQUIPMENT

8-1 INTRODUCTION: SELECTED PORTIONS OF OSHA STANDARDS, PART 1926 – SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION – SUBPART E – PERSONAL PROTECTIVE AND LIFESAVING EQUIPMENT

“§ 1926.104 Safety belts, lifelines, and lanyards.

“(a) Lifelines, safety belts, and lanyards shall be used only for employee safeguarding. Any lifeline, safety belt, or lanyard actually subjected to in-service loading, as distinguished from static load testing, shall be immediately removed from service and shall not be used again for employee safeguarding.

“(b) Lifelines shall be secured above the point of operation to an anchorage or structural member capable of supporting a minimum dead weight of 5,400 pounds.

“(c) Lifelines used on rock-scaling operations, or in areas where the lifeline may be subjected to cutting or abrasion, shall be a minimum of 7/8-inch wire core manila rope. For all other lifeline applications, a minimum of 3/4-inch manila or equivalent, with a minimum breaking strength of 5,400 pounds, shall be used.

“(d) Safety belt lanyard shall be a minimum of 1/2-inch nylon, or equivalent, with a maximum length to provide for a fall of no greater than 6 feet. The rope shall have a nominal breaking strength of 5,400 pounds.

“(e) All safety belt and lanyard hardware shall be drop forged or pressed steel, cadmium plated in accordance with type 1, Class B plating specified in Federal Specification QQ-P-416. Surface shall be smooth and free of sharp edges.

“(f) All safety belt and lanyard hardware, except rivets, shall be capable of withstanding a tensile loading of 4,000 pounds without cracking, breaking, or taking a permanent deformation.

“§ 1926.105 Safety nets.

“(a) Safety nets shall be provided when workplaces are more than 25 feet above the

ground or water surface, or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety belts is impractical.

“(b) Where safety net protection is required by this part, operations shall not be undertaken until the net is in place and has been tested.

“(c) (1) Nets shall extend 8 feet beyond the edge of the work surface where employees are exposed and shall be installed as close under the work surface as practical but in no case more than 25 feet below such work surface. Nets shall be hung with sufficient clearance to prevent user's contact with the surfaces or structures below. Such clearances shall be determined by impact load testing.

“(2) It is intended that only one level of nets be required for bridge construction.

“(d) The mesh size of nets shall not exceed 6 inches by 6 inches. All new nets shall meet accepted performance standards of 17,500 foot-pounds minimum impact resistance as determined and certified by the manufacturers, and shall bear a label of proof test. Edge ropes shall provide a minimum breaking strength of 5,000 pounds.

“(e) Forged steel safety hooks or shackles shall be used to fasten the net to its supports.

“(f) Connections between net panels shall develop the full strength of the net.

“§ 1926.106 Working over or near water.

“(a) Employees working over or near water, where the danger of drowning exists, shall be provided with U.S. Coast Guard-approved life jacket or buoyant work vests.

“(b) Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects which would alter their strength or buoyancy. Defective units shall not be used.

“(c) Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.

“(d) At least one lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water.”

8-2 SPECIFIC ITEMS FOR SAFETY AND LIFESAVING

A. BELT, SAFETY, BODY TYPE (fig. 8-1)

A nylon-cotton or leather belt, equipped with body pad and "D" rings. Sized from 32- to 50-inch waist.

Source: LIN 80475N

Use: To prevent falls while engaged in high work when used in conjunction with lanyard.

Limitation: 4,000 pounds tensile strength (1-3/4" wide and 5/32" thick). 5,000 to 9,000 pounds tensile strength available in nylon.



Figure 8-1. Belt, Safety, Body Type.

B. BELT, SAFETY, SUSPENSION TYPE, BOSUN'S TYPE (fig. 8-2)

Nylon web with leg straps and hardwood seat with a leather band, reinforcing webbing around the seat.

Source: Appendix A

Use: To provide complete freedom of movement while suspended in such activities as silos, shafts, or rescue operations.

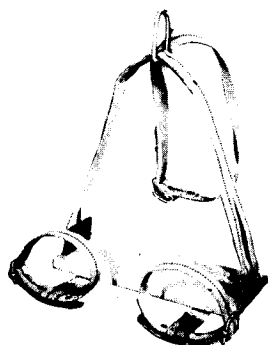


Figure 8-2. Belt, Safety, Suspension Type, Bosun's Type.

C. BELT, LADDER, SAFETY (fig. 8-3)

A padded, waist-type, leather, safety belt equipped with a large, drop-forged snap with keeper for snapping over ladder rung, adjustable.

Source: Appendix A

Use: By personnel required to use relatively high, straight ladders to prevent falling.

Limitation: Can be used only on ladders with round rungs.



Figure 8-3. Belt, Ladder, Safety.

D. BELT, SAFETY, INDUSTRIAL, LINE-MAN'S TYPE, WITH SAFETY STRAP (fig. 8-4)

An adjustable web or leather body belt with tool holders and two "D" rings.

Source: LIN B60115

NSN 4240-00-595-3028

Use: By electrical lineman, workers stocking crude rubber fiber and cordage, telephone installers, repairmen, and wiremen MOS 36K to prevent falls from elevated positions.



Figure 8-4. Belt, Safety, Industrial, Lineman's Type, With Safety Strap.

E. HARNESS, SAFETY, INDUSTRIAL (fig. 8-5)

A web- or leather-type safety harness consisting of an adjustable body belt and shoulder straps, with "D" ring.

Source: LIN 52730N

Use: By personnel working in confined and precarious positions requiring protection from falling while being raised or lowered, or in rescue work when stretcher cannot be used.



Figure 8-5. Harness, Safety, Industrial.

F. LADDER, JACOBS: STEEL RUNGS, 16 IN. WIDE, 25 FT LONG (fig. 8-6)

Source: LIN L-35054
NSN 2090-00-242-2513

Use: In marine operations; rescue from open pits, steep inclines, etc.

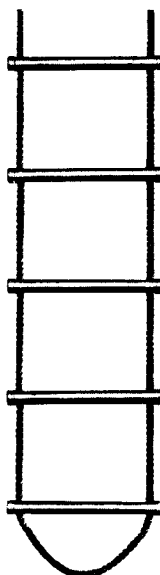


Figure 8-6. Ladder, Jacobs: Steel Rungs, 16 In. Wide, 25 Ft Long.

G. LANYARD (fig. 8-7)

A tail line of manila, nylon, or steel, equipped with snaps to fasten to a safety belt.

Source: Appendix A

Use: For use in construction, maintenance, and general repair work where worker must tie onto permanent object. This provides protection from falls and affords freedom of movement.



Figure 8-7. Lanyard.

H. LIFEBOAT, INFLATABLE: 7 PERSON

Source: LIN L-56877
NSN 1940-00-368-2896

I. LIFE FLOAT: 5 PERSON

Source: LIN L-56740
NSN 4220-00-244-0834

J. LIFE FLOAT: 25 PERSON

Source: LIN L-57171
NSN 4220-00-251-8002

K. LIFE PRESERVER, VEST: UNICELLULAR, PLASTIC PADS, 24 IN. HIGH

Source: NSN 4220-00-200-0538

Use: By organizational maintenance technician performing marine maintenance duty.

Reference: CTA 50-970

L. NET, SAFETY (fig. 8-8)

A lifesaving, small mesh, manila net slung under high construction or maintenance jobs. Specify size and rope type desired, polypropylene or nylon rope.

Source: Appendix A

Use: For workers engaged in high construction or maintenance projects.

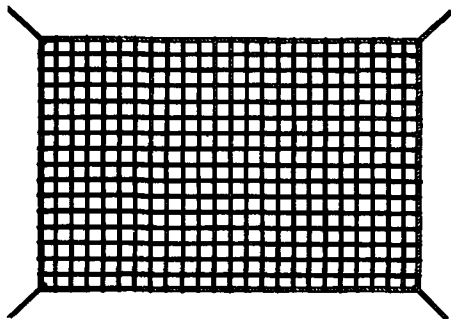


Figure 8-8. Net, Safety.

**M. NET, SAVE-ALL: 20 FT X 40 FT 8 IN.,
MANILA WITH LANYARDS**

Source: LIN N-02819
NSN 3940-00-272-9291

**N. RING BUOY, LIFESAVING: CORK,
DRILL COVERED, 24 IN. OD, 13 IN. ID**

Source: LIN R-98669
NSN 4220-00-273-6690

**O. RING BUOY, LIFESAVING: CORK,
DRILL COVERED, 30 IN. OD, 17 IN. ID**

Source: LIN R-98806
NSN 4220-00-273-6691

**P. RING BUOY, LIFESAVING: PLASTIC
RED, 30 IN. OD, WITH LIFE LINE**

Source: LIN R-99080
NSN 4220-00-275-3157

**Q. SKIFF: OAR PROPELLED, WOOD, 14 FT
LONG**

Source: LIN T-66060
NSN 1940-00-268-9945

CHAPTER 9. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR AVIATION

9-1 AIR PILOTS, CREWS, AND PASSENGERS

The items listed below are not stored or issued as an ensemble, and there are variations in gloves, coveralls, and jackets, depending on the climatic zone of operations. Therefore, requirements must be submitted for individual items. Items listed below are representative of equipment and clothing likely to be required in the normal course of peacetime flying. For additional items that may be required, see "Protective Body Clothing," chapter 5, or "Extreme Temperature and Weather Conditions," chapter 15.

For a Typical Peacetime Flight Clothing Outfit, see figure 9-1.



Figure 9-1. Typical Peacetime Flight Clothing Outfit

9-2 SPECIFIC ITEMS FOR AVIATION

A. BAG, FLYING HELMET: NYLON OUTER SHELL, LINED WITH POLYESTER (fig. 9-2)

Source: LIN B-14797
NSN 8415-00-782-2989

Use: Per individual authorized helmet LIN K-34252 and helmet K-33637 (Combat Vehicle Crewman's: FM Radios) for storage and protection purposes WAB sub-MACOM or State AG.

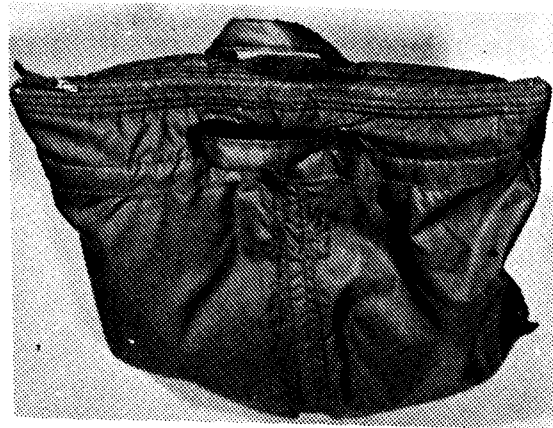


Figure 9-2. Bag, Flying Helmet: Nylon Outer Shell, Lined With Polyester

B. CASE, FLYING HELMET AND OXYGEN MASK

A protective soft case for carrying flight helmet and oxygen mask.

Source: LIN D-65413
NSN 8415-00-753-2901

Use: For storage and protection of flight helmet and oxygen mask.

C. COVERALLS, FLYING, ANTIEXPOSURE: NYLON RIPSTOP, ORANGE YELLOW

A one-piece, quick-donning type, waterproof coverall with integral hood and boots, and adjustable body and boot straps.

Source: LIN F-31987
NSN 8475-00-273-1853

Use: By aviators and crew members whose aircraft fly on extended over-water flights when authorized by major subordinate commander, or by installations performing air-sea rescue missions when authorized by Army commander.

D. GLOVES, FLYER'S: NYLON, FIRE RETARDANT, TYPE GS/FRP-2

Source: LIN J-67052
NSN 8415-00-139-5408 through 5412

Use: By individual on flying status whose primary duty is flying.

E. GLOVE SHELLS, FLYERS: SHEEPSKIN, DARK BROWN

Source: LIN J-67927
NSN 8415-00-261-4768 through 4771
NSN 8415-00-985-7407 and 7408

Use: Same as D above.

F. HELMET, FLYER'S: CRASH-TYPE, GLASS OUTER SHELL, OG-106

Source: LIN K-34252
NSN 8415-00-144-4091 (Reg.)
NSN 8415-00-144-4985 (X-Lg.)
(NSN 8415-00-143-8577; Earcup Seals)

Use: By individual on flying status and passenger seat in observation aircraft; civilian test pilot and instructor; allied student attending flying course.

G. JACKET, FLYER'S: MAN'S LIGHT-WEIGHT, NONMELTING

Source: LIN L-14475
NSN 8415-00-217-7201
(various sizes)

H. JACKET, FLYER'S: MAN'S MEDIUM WEIGHT NONMELTING

Source: LIN L-14520
NSN 8415-00-221-7387
(various sizes)

I. LIFE PRESERVER: AIRCRAFT CREW

Source: LIN L-57288
NSN LPU-2/P 4220-00-630-8714
NSN MARK 2 4220-00-630-1463

Use: By aviator, crewmember, or seat in authorized aircraft.

J. LIFE RAFT, INFLATABLE: GAS AND MANUAL, 7 PERSON

Source: LIN L-58110
NSN 4220-00-245-7751

K. LIFE PRESERVER: PARACHUTIST

Source: LIN L-57699
NSN 4220-00-657-2197

Use: Per passenger seat in aircraft WAB MACOM or sub-MACOM; per parachutist NOA.

L. MASK, OXYGEN

Source: NSN 1660-00-809-0390 (Large)
NSN 1660-00-809-0379 (Medium)
NSN 1660-00-809-0391 (Small)

Use: Per crewmember in aircraft with demand oxygen system.

Reference: CTA 50-970

M. MIRROR, EMERGENCY SIGNALING: WITH FORESIGHT

Source: LIN M-49596
NSN 6350-00-923-7451

N. PARKA, INSULATED, EXTREME COLD WEATHER: GREEN WITH FUR RUFF

Source: LIN N-69886
NSN 8415-00-890-2028 through 2031

Use: By crewchief, mechanic, flight crewmember, noncrewmember, zones V through VII, WAB sub-MACOM or State AG.

O. SHIRT, FLYER'S: MEN'S, HIGH TEMPERATURE RESISTANT — NYLON TWILL, OG 106

Source: LIN T-03002
NSN 8415-00-935-4891 through 4901
NSN 8415-00-935-6200 through 6203
(various sizes)

P. SIGNAL KIT: PERSONNEL, DISTRESS, RED, M185

Source: LIN T-51271
NSN 1370-00-921-6172

Use: By aircrew member on flying status.

Q. SUNGLASSES: MAN'S SPECTACLE TYPE

Type HGU-4P sunglasses, with case.

Source: LIN J-61447
NSN 8465-00-753-6261

Use: To protect eyes from sun glare.

R. SURVIVAL KIT, INDIVIDUAL: COLD CLIMATE

Source: LIN U-72412
NSN 1680-00-973-1862

Use: By individual on flying status.

S. SURVIVAL KIT, INDIVIDUAL: COLD CLIMATE, FOR OV-1 AIRCRAFT

Source: LIN U-72480
NSN 1680-00-782-3003

Use: By individual on flying status.

Limitation: This kit is for use with OV-1 aircraft only.

T. SURVIVAL KIT, INDIVIDUAL: HOT CLIMATE

Source: LIN U-72549
NSN 1680-00-973-1861

Use: By individual on flying status.

U. SURVIVAL KIT, INDIVIDUAL: HOT CLIMATE OV-1 AIRCRAFT

Source: LIN U-72569
NSN 1680-00-965-4701

Use: By individual on flying status.

Limitation: This kit is for use with OV-1 aircraft only.

V. SURVIVAL KIT, INDIVIDUAL: OVERWATER

Source: LIN U-72686
NSN 1680-00-973-1863

Use: By individual on flying status.

W. SURVIVAL KIT: OVERWATER, OV-1 AIRCRAFT

Source: LIN U-72696
NSN 1680-00-965-4702

Use: By individual on flying status.

Limitation: This kit is for use with OV-1 aircraft only.

X. SURVIVAL KIT, INDIVIDUAL: VEST-TYPE, C/O COMPONENTS

Source: LIN U-72733
NSN 8465-00-177-4819

Use: By individual on flying status.

Y. SURVIVAL KIT, INDIVIDUAL VEST: LARGE

Source: LIN U-72767
NSN 1680-00-205-0474

Use: By individual on flying status.

Z. SURVIVAL KIT, INDIVIDUAL VEST: SMALL

Source: LIN U-72777
NSN 1680-00-187-5716

Use: By individual on flying status.

AA. SURVIVAL KIT, SEAT: COLD CLIMATE

Source: LIN U-72797
NSN 1680-00-148-9233

BB. SURVIVAL KIT, SEAT: HOT CLIMATE

Source: LIN U-72807
NSN 1680-00-148-9234

CC. SURVIVAL KIT, SEAT: OVERWATER

Source: LIN U-72822
NSN 1680-00-140-3540

DD. TOOL KIT, SURVIVAL: TYPE IV, WITH CARRYING CASE

Source: LIN W-57047
NSN 8465-00-973-4807

Use: Per aircraft (except OV-1 type) NOA survival kits LIN U-72549 or U-72686 WAB MACOM, sub-MACOM, or State AG.

**EE. TROUSERS, INSULATED, EXTREME
COLD WEATHER: GREEN WRT**

Source: LIN X-35961
NSN 8415-00-768-4152
(various sizes)

Use: By crewchief, mechanic, and flight crew-
member.

**FF. TROUSERS: FLYING, MEN'S: HIGH
TEMPERATURE RESISTANT, NYLON
Twill, OG106**

Source: LIN X-35980
NSN 8415-00-935-4878 through 4890
NSN 8415-00-935-6206 and 6207

CHAPTER 10. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR BIOLOGICAL HAZARDS

10-1 INTRODUCTION

Special protective clothing and equipment are required when working with biological agents. It is recommended that a review of chapter 3, "Respiratory Hazards and Protection," be made prior to the handling of, or exposure to, biological agents.

Biological agents can initiate or complicate infection of the skin, eyes, nose and throat, respiratory system, nervous system, and digestive system in various degrees of seriousness from minor irritation to death. Most infections are acute in nature rather than chronic. Before coming in contact with biological agents, analyze the clothing and equipment for the task.

10-2 SELECTED PORTIONS OF OSHA STANDARDS, PART 1910 – OCCUPA- TIONAL SAFETY AND HEALTH STANDARDS – SUBPART R – SPECIAL INDUSTRIES

"(3) *Use and care of protective clothing and equipment.* (i) All protective clothing, required by this section, shall be thoroughly washed or disposed of after each day's use.

"(ii) All respirators and gas masks shall be cleaned and maintained in accordance with § 1910.134(f).

"(iii) Any employer who gives pesticide-contaminated clothing or equipment to another person for laundering, cleaning, or maintenance shall inform such person of the warnings and precautions to be taken, as described on the label of the pesticide which has contaminated the clothing or equipment.

"(iv) When protective clothing or equipment is cleaned or washed, the process shall be conducted in a manner that will prevent wash-water wastes from the clothing or equipment from creating a hazard to the health of employees.

"(v) When the same clothing or equipment is to be used by more than one employee in a given day, the clothing or equipment shall be

adequately washed or cleaned before it is passed from one employee to another.

"(vi) When the protective clothing becomes contaminated with a pesticide to the extent that the skin could become contaminated, the clothing shall be removed and the skin washed.

"(4) *Sanitation.* (i) The employer shall provide an adequate supply of potable water for emergency washing purposes in reasonable vicinity to any field treated with a pesticide.

"(ii) Employers shall not permit employees to store, eat, or drink food or beverage where the food or beverage may be exposed to pesticides.

"(iii) Employers shall provide a change room or area for employees required to wear protective clothing as specified in this section. Within the change room, or area, there shall be provided an individual locker, container, or hanger for the uncontaminated clothing of each employee. A separate container shall be provided for contaminated clothing and equipment.

"(iv) The washing and change room facilities shall be separate from those provided for other purposes.

"(d) *Medical services and first aid.* (1) The employer shall make arrangements to provide necessary medical assistance to employees who may suffer injuries or illnesses as a result of occupational exposure to pesticides.

"(2) The employer shall insure that each crew leader or foreman is instructed to recognize early symptoms of organophosphorous pesticide poisoning and to take appropriate protective measures."

10-3 SELECTED PORTIONS OF OSHA STANDARDS, PART 1910 – OCCUPA- TIONAL SAFETY AND HEALTH STANDARDS – SUBPART G – OCCU- PATIONAL HEALTH AND ENVIRON- MENTAL CONTROL

"(5) *Maintenance and decontamination activities.* In cleanup of leaks or spills, maintenance or repair operations on contaminated systems or equipment, or any operations involv-

ing work in an area where direct contact with methyl chloromethyl ether could result, each authorized employee entering that area shall:

- (i) Be provided with and required to wear clean, impervious garments, including gloves, boots and continuous-air supplied hood in accordance with § 1910.134.

- “(ii) Be decontaminated before removing the protective garments and hood;

- “(iii) Be required to shower upon removing the protective garments and hood.

“(6) *Laboratory activities.* The requirements of this subparagraph shall apply to research and quality control activities involving the use of methyl chloromethyl ether.

- (i) Mechanical pipetting aids shall be used for all pipetting procedures.

- “(ii) Experiments, procedures and equipment which could produce aerosols shall be confined to laboratory-type hoods or glove boxes.

- “(iii) Surfaces on which methyl chloromethyl ether is handled shall be protected from contamination.

- “(iv) Contaminated wastes and animal carcasses shall be collected in impervious containers which are closed and decontaminated prior to removal from the work area. Such wastes and carcasses shall be incinerated in such a manner that no carcinogenic products are released.

- “(v) All other forms of methyl chloromethyl ether shall be inactivated prior to disposal.

- “(vi) Laboratory vacuum systems shall be protected with high-efficiency scrubbers.

- “(vii) Employees engaged in animal support activities shall be (a) provided with, and required to wear, a complete protective clothing change, clean each day, including coveralls or pants and shirt, foot covers, head covers, gloves, and appropriate respiratory protective equipment or devices; and

- “(b) Prior to each exit from a regulated area, employees shall be required to remove and leave protective clothing and equipment at the point of exit and at the last exit of the day, to place used clothing and equipment in impervious containers at the point of exit for purposes of decontamination or disposal. The contents of such impervious containers shall be identified as required under paragraphs (e) (2), (3), and (4) of this section.

- “(c) Required to shower after the last exit of the day.

- “(viii) Employees, other than those engaged only in animal support activities, each day shall be (a) provided with and required to wear a clean change of appropriate laboratory clothing, such as a solid front gown, surgical scrub suit, or fully buttoned laboratory coat.

- “(b) Prior to each exit from a regulated area, employees shall be required to remove and leave protective clothing and equipment at the point of exit and at the last exit of the day, to place used clothing and equipment in impervious containers at the point of exit for purposes of decontamination or disposal. The contents of such impervious containers shall be identified as required under paragraphs (e) (2), (3), and (4) of this section.

- “(c) Required to wash hands, forearms, face and neck upon each exit from the regulated area close to the point of exit, and before engaging in other activities.

- “(ix) Air pressure in laboratory areas and animal rooms where methyl chloromethyl ether is handled and bioassay studies are performed shall be negative in relation to the pressure in surrounding areas. Exhaust air shall not be discharged to regulated areas, nonregulated areas or the external environment unless decontaminated.

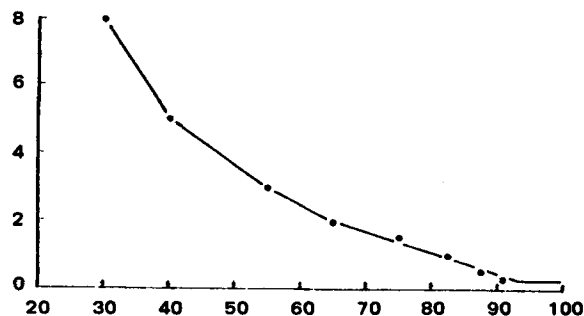
- “(x) There shall be no connection between regulated areas and any other areas through the ventilation system.

- “(xi) A current inventory of methyl chloromethyl ether shall be maintained.

- “(xii) Ventilated apparatus such as laboratory type hoods, shall be tested at least semi-annually or immediately after ventilation modification or maintenance operations, by personnel fully qualified to certify correct containment and operation.”

10-3.1 PHYSIOLOGICAL STRESS IMPOSED BY PROTECTIVE CLOTHING SYSTEMS

Protective suits and coverings which protect the user by isolating him from hostile environments inherently increase and contain the buildup of body heat, effectively raising the ambient temperature the user must operate in. This buildup of body heat will reduce the sustained maximum work capacity of the user as well as reduce the time he can remain in the protective



(From U.S. Army Science Conference Proceedings June 1970, "Tactical Implications of Physiological Stress Imposed by Chemical Protective Clothing Systems," by permission.)

Figure 10-1. Typical Closed Suit Wear Time for Impermeable Systems.

clothing. Fig. 10-1 is a graph of typical anticipated closed suit wearing time at various external ambient temperatures.

10-4 LABORATORY SAFETY

The OSHA standards have no special section on laboratory safety and health requirements, but many of the individual standards do apply to laboratory operations, such as:

Subpart H — Hazardous Material

1910.101 Compressed Gases

Subpart I — Personal Protective Equipment

1910.132 General Requirements

1910.133 Eye and Face Protection

1910.134 Respiratory Protection

Subpart K — Medical and First Aid

1910.151 Medical Services and First Aid

Subpart M — Compressed Gas and Compressed Air Equipment

1910.166 Inspection of Compressed Gas Cylinders

1910.167 Safety Relief Devices for Compressed Gas Cylinders

Subpart S — Electrical

1910.309 National Electric Code NFPA 70-1971

Subpart Z — Occupational Health and Environmental Control

1910.1000	Air Contaminants
1910.1001-1017	Carcinogens
1910.94	Ventilation
1910.96	Ionizing Radiation
1910.97	Nonionizing Radiation

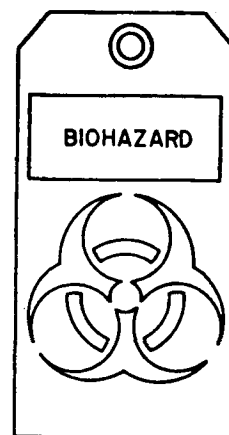
10-4.1 OSHA BIOLOGICAL HAZARD TAGS (Section 1910.145 — Specifications for Accident Prevention Signs and Tags.)

“(8) *Biological hazard tags.* (i) The standard background color for the Biological Hazard symbol is optional as long as there is sufficient contrast for the symbol to be clearly defined. The symbol design (see fig. J-15) shall be a fluorescent orange or orange-red color.

“(ii) The Biological Hazard tag shall be used to signify the actual or potential presence of a biohazard, to identify equipment, containers, rooms, materials, experimental animals, or combinations thereof, which contain or are contaminated with viable hazardous agents.

“(iii) For the purpose of this subparagraph, the term ‘biological hazard’ shall include only those infectious agents presenting a risk or potential risk to the well-being of man.”

For additional safety tags, see chapter 18, “Special Safety Protective Clothing and Equipment for Transportation.”



White tag
black letters on
fluorescent-orange
background and
symbol

Figure J-15. Biological Hazard Tag

10-5 SPECIFIC ITEMS FOR BIOLOGICAL PROTECTION

A. AIR SAMPLER, SIEVE AND SLIT

A sampling device that determines the level of microbial contamination in a laboratory.

Source: Appendix A

Use: To determine the level of microbial contamination in a laboratory.

B. CAGE, ANIMAL

A ventilated cage designed to enclose one animal whose body has been exposed to infectious aerosol.

Source: Appendix A

Use: To confine an experimental animal that has been exposed to infectious aerosol in order to prevent contamination of the laboratory.

C. DECONTAMINATING AGENT: BIOLOGICAL

Source: LIN F-80921

NSN 6850-00-827-2791

Use: One gallon decontaminating agent.

Reference: Milspec D-51018

NOTE: For other quantities, see CTA 50-970.

D. FILTER, PARTICULATE, 3CFM, M14 (fig. 10-2)

A cylindrical canister with an internally threaded nozzle at inlet end and an externally



Figure 10-2. Filter, Particulate, 3CFM, M14.

threaded nozzle at outlet end. Canister marked with direction of air flow.

Source: LIN C-92981

NSN 4240-00-203-3733

Use: With respiratory devices, such as masks or supplied-air outfits, to protect personnel engaged in research with biological and radiological agents against all types of particulate contaminants (aerosol) in the atmosphere.

Reference: TB 3-205-1

Limitation: This filter WILL NOT protect against toxic gases.

E. GLOVES, ARM-LENGTH, SYNTHETIC RUBBER (fig. 10-3)

An arm-length, straight-sleeve glove made of either 17- or 30-mil-thick neoprene with beaded 8-inch-diameter ring for attachment to the glove-port ring of a gastight steel cabinet.

Source: Appendix A

Use: To protect hands and arms of personnel required to work with biological and other harmful materials in enclosed cabinets.

Limitation: Gloves should be dielectric tested to determine leaks or weak spots.

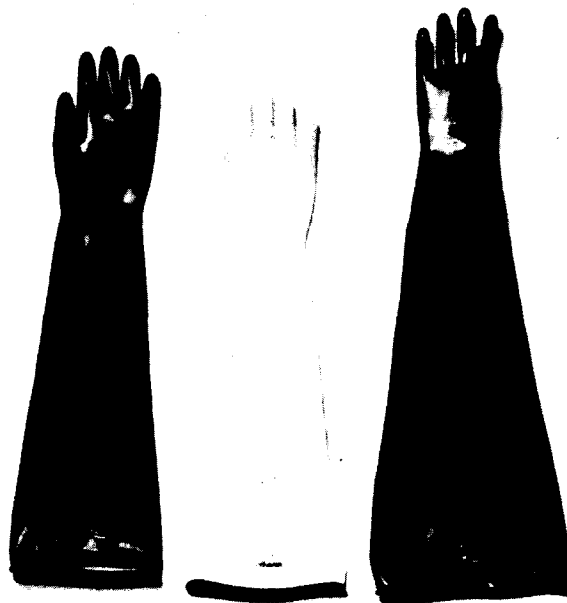


Figure 10-3. Gloves, Arm-length Synthetic Rubber.

F. GLOVEBOX, CONTROLLED ATMOSPHERE: LABORATORY TYPE (fig. 10-4)

An enclosed laboratory box with glass panel and rubberized entry gloves to permit manipulation of items within the box without actual exposure to the contents. Exhaust may be filtered to remove dangerous contaminants.

Source: LIN 03997A
NSN 0000-00-003-987A
Fisher Science

Use: The apparatus is useful in radiochemistry, urology, metallurgy, bacteriology, etc. When radioactive materials are used, the boxes must be equipped with lead shields, lead-glass windows, and remote control handling equipment.

G. WATER TESTING KIT, BACTERIOLOGICAL

Source: LIN Y-37130
NSN 6665-00-682-4765

Use: By personnel in health and environment programs.

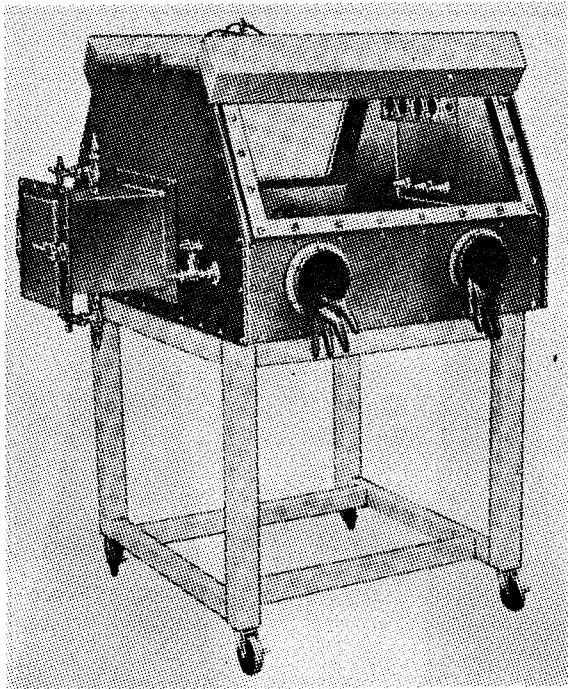


Figure 10-4. Glovebox, Controlled Atmosphere:
Laboratory Type

10-6 CLOTHING AND EQUIPMENT FOR BIOLOGICAL HAZARDS

The items listed below are described in other chapters of this pamphlet. For items not listed, refer to appendix B, "Safety Item Index."

Air-sampling Devices as Needed - Chapter 3

Anklets, Women's: Cotton, Heavy Weight

LIN 80253N - Chapter 6

Cap, Clean Room: White, Orlon/Dacron

LIN 81120N - Chapter 4

Cap, Protective, Maintenance Personnel:
Powder Shop, White, Drill

LIN 81160N - Chapter 4

Coveralls, Men's: White, Cotton Sateen,
Carded, 8.802

LIN F-32535 - Chapter 5

Drawers, Men's: Cotton, Thigh Length,
White, Elastic Waist Band

LIN G-48939 - Chapter 5

Faceshield and Goggles as Needed - Chapter
4

Gloves, Rubber Gauntlet - Chapter 7

Gloves, Latex, Surgical - Chapter 7

Gloves, Rubber: Acid and Alkali Resistant,
Black, Type I

LIN J-69160 - Chapter 7

Hat and Insect Net

LIN K-19869 - Chapter 4

Overshoes: Nylon, White, Lint and Dust
Free

LIN 85876N - Chapter 6

Respiratory Devices as Needed - Chapter 3
Sampling and Analyzing Kit, CB Agent,
ABC-M19

LIN S-29577 - Chapter 3

Shoes, Rubber, Safety Toe

LIN 87258N - Chapter 6

Socks, Men's: Cotton-Nylon, Black, Shade
94, Stretch

LIN T-92171 - Chapter 6

10-7 HAZARDS ASSOCIATED WITH BIOLOGICAL HAZARDS

If, at times, additional hazards may be encountered, reference should be made to the specific chapter pertaining to that hazard for the selection of appropriate supplementary protective items. For example, if the additional hazard happens to be "Contaminated Atmospheres,"

refer to chapter 3, "Respiratory Hazards and Protection."

10-8 HANDLERS OF TOXICOLOGICAL AGENTS

An ensemble is required for personnel handling toxicological agents or for personnel assigned to CBR teams. The ensemble is not issued as a unit; therefore, requirements must be submitted for each item within the ensemble. (See chapter 3, "Respiratory Hazards and Protection," for selection of proper mask, respirator, or breathing apparatus, and detection and sampling devices.)

The Ensemble Toxicological Agents Protective (TAP) consists of the following individual items:

A. APRON, TAP: COTTON CLOTH, RUBBER COATED, OD

Source: LIN A-87412

NSN 8415-00-281-7813 through 7815

B. BOOTS, TAP: M2A1

Source: LIN C-08804

NSN 8430-00-820-6259 through 6306
(various sizes)

NOTE: Boot, insulated, cold weather, man's, rubber, black, protective (LIN C-08119); boot, impermeable (LIN C-08804); and other combat or knee boots do not provide sufficient protection against biological hazards. Cover, footwear, toxicological (LIN F-28473), should be worn in all weather conditions as additional protection, regardless of which boots are worn.

C. COVER, FOOTWEAR, TAP: COTTON DUCK, OD, 177

Source: LIN F-28473

NSN 8430-00-262-5295 through 5297

D. COVERALLS, TAP, COTTON, AIR PLANE CLOTH

Source: LIN F-33220

NSN 8415-00-272-3022 through 3024
with zipper
NSN 8415-00-099-6962, 6968,
and 6970 with buttons

E. GLOVES, TAP, MEN'S, BUTYL RUBBER

Source: LIN J-70393

NSN 8415-00-753-6550 through 6554

F. HOOD, GAS MASK, TAP, DOUBLE COATED

Source: LIN K-45398

NSN 8415-00-261-6690

G. HOOD, GAS MASK, TAP, SINGLE COATED

Source: LIN K-45535

NSN 8415-00-281-2558

H. SOCKS, MEN'S, WOOL, CUSHION SOLE, OG408, STRETCH TYPE SOCK, CHEMICAL PROTECTIVE

Source: LIN T-93335

NSN 8415-00-782-2171 through 2173

Use: "Per chemical officer of post/camp/station; individual in demilitarization, demolition, and safety sections of chemical technical escort detachment; individual assigned munition, test facility, CW field test, and BW field test battalions, handling toxic chemical munitions at environmental test sites; individual in MOS 55B, 55X; department of nuclear science

"Per male individual handling chemical munition as required for safety WAB State AG ..

"Per male individual engaged in extremely hazardous decontamination work or in other special operations involving danger from spillage or splash of liquid chemical agents (TM 10-277)

"Per civilian handling toxical agents; civilian assigned CBR team requiring full protection"

CHAPTER 11. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR CHEMICAL HAZARDS

11-1 INTRODUCTION

Chemical substances are a common cause of skin disorders to include burns, inflammations, and dermatoses. Chemical injuries to the skin may also enhance secondary bacterial or fungal infections. Additionally, certain chemical substances may be absorbed through the skin and result in adverse internal toxic effects.

Local effects of chemical substances may be divided into primary skin irritants and skin sensitizers. A primary irritant is a chemical that causes damage by direct action on normal skin at the site of contact. This effect is a function not only of the inherent potential of the chemical, but also undivided susceptibility, concentrations, and contact time. The skin sensitizers may not produce obvious skin abnormalities on first contact. However, this initial exposure to a sensitizer alters skin reactivity such that subsequent contact on the same or other parts of the body with the material will result in dermatitis. Although certain substances have a greater propensity for sensitization than others, actual sensitization is a highly individualistic response. It is independent of the amount of the chemical and may occur suddenly after many uneventful contacts with the material. Primary irritants may also become sensitizers. In this circumstance, brief contact with dilute concentrations that would not otherwise produce irritation might result in sensitization.

Gloves and protective skin creams will aid in the control of dermatitis; however, they are not a substitute for cleanliness of the working environment or for personal cleanliness. Both the government and industry must be on the alert to the many new chemicals that are developed. New data specifications and test results that will disclose the proper protection for the new chemical must be secured. Prior to handling new chemicals, it is recommended that the safety department and the medical department be contacted to determine what precautions should be taken to avoid injury.

Another immediate danger to personnel handling chemicals is the transfer of liquid chemicals. Without proper equipment, dangerous liquids may be spilled or splashed, containers

may be dropped and broken or become unsafe because of corrosion. Good safety practices and the use of proper equipment and clothing reduce the injuries caused by improper handling of liquid chemicals.

For warnings, see chapter 18, "Special Safety Protective Clothing and Equipment for Transportation."

Any protective clothing worn over or in addition to normal clothing may cause an increase in body heat buildup and reduce the sustained maximum work capacity of the user. See chapter 10, section 10-31.

Chapter 5, "Protective Body Clothing," and chapter 10, "Special Safety Protective Clothing and Equipment for Biological Hazards," contain additional items of clothing for protection in handling chemicals. Also consult TM 10-277, *Protective Clothing for Chemical Operations*.

11-2 SELECTED PORTIONS OF OSHA STANDARDS, PART 1910 – SUBPART H – HAZARDOUS MATERIALS – RELATED TO HANDLING CHEMICALS

"(9) *Personal protection*. (i) All employees working in and around open-surface tank operations must be instructed as to the hazards of their respective jobs, and in the personal protection and first aid procedures applicable to these hazards.

"(ii) All persons required to work in such a manner that their feet may become wet shall be provided with rubber or other impervious boots or shoes, rubbers, or wooden-soled shoes sufficient to keep feet dry.

"(iii) All persons required to handle work wet with a liquid other than water shall be provided with gloves impervious to such a liquid and of a length sufficient to prevent entrance of liquid into the tops of the gloves. The interior of gloves shall be kept free from corrosive or irritating contaminants.

"(iv) All persons required to work in such a manner that their clothing may become wet shall be provided with such aprons, coats, jackets, sleeves, or other garments made of rubber, or of other materials impervious to liquids other

than water, as are required to keep their clothing dry. Aprons shall extend well below the top of boots to prevent liquid splashing into the boots. Provision of dry, clean, cotton clothing along with rubber shoes or short boots and an apron impervious to liquids other than water shall be considered a satisfactory substitute where small parts are cleaned, plated, or acid dipped in open tanks and rapid work is required.

“(v) Whenever there is a danger of splashing, for example, when additions are made manually to the tanks, or when acids and chemicals are removed from the tanks, the employees so engaged shall be required to wear either tight-fitting chemical goggles or an effective face shield. See § 1910.133.

“(vi) When during emergencies as described in subparagraph (11)(v) of this paragraph, workers must be in areas where concentrations of air contaminants are greater than the limit set by subparagraph (2)(iii) of this paragraph, or oxygen concentrations are less than 19.5 percent, they shall be required to wear respirators adequate to reduce their exposure to a level below these limits, or to provide adequate oxygen. Such respirators shall also be provided in marked, quickly accessible storage compartments built for the purpose, when there exists the possibility of accidental release of hazardous concentrations of air contaminants. Respirators shall be approved by the U.S. Bureau of Mines, U.S. Department of the Interior and shall be selected by a competent industrial hygienist or other technically qualified source. Respirators shall be used in accordance with § 1910.134, and persons who may require them shall be trained in their use.

“(vii) Near each tank containing a liquid which may burn, irritate, or otherwise be harmful to the skin if splashed upon the worker's body, there shall be a supply of clean cold water. The water pipe (carrying a pressure not exceeding 25 pounds) shall be provided with a quick opening valve and at least 48 inches of hose not smaller than three-fourths inch, so that no time may be lost in washing off liquids from the skin or clothing. Alternatively, deluge showers and eye flushes shall be provided in cases where harmful chemicals may be splashed on parts of the body.

“(viii) Operators with sores, burns, or other skin lesions requiring medical treatment shall not be allowed to work at their regular

operations until so authorized by a physician. Any small skin abrasions, cuts, rash, or open sores which are found or reported shall be treated by a properly designated person so that chances of exposures to the chemicals are removed. Workers exposed to chromic acids shall have a periodic examination made of the nostrils and other parts of the body, to detect incipient ulceration.

“(ix) Sufficient washing facilities, including soap, individual towels, and hot water, shall be provided for all persons required to use or handle any liquids which may burn, irritate, or otherwise be harmful to the skin, on the basis of at least one basin (or its equivalent) with a hot water faucet for every 10 employees. See § 1910.141(d).

“(x) Locker space or equivalent clothing storage facilities shall be provided to prevent contamination of street clothing.

“(xi) First aid facilities specific to the hazards of the operations conducted shall be readily available.”

11-3 LABORATORY SAFETY

See chapter 10, section 10-4.

11-4 SPECIFIC ITEMS FOR PROTECTION AGAINST CHEMICALS

A. BOOT, COMBAT: MEN'S

A black leather boot, mildew resistant, 10 ½ inches high with rubber soles and heels.

Source: LIN C-06749

NSN — See SB 700-20 (various sizes)

Use: In lieu of rubber boots.

Limitation: Must be treated with protective dressing and used in combination with protective footwear cover.

B. LEATHER DRESSING, VESICANT GAS RESISTANT, M2

Source: LIN L-49585,

4 oz can:

NSN 8030-00-273-8719

5 gal pail:

NSN 8030-00-926-2235

Use: To soften, preserve, and waterproof leather boots and shoes, and to retard the pas-

sage of vesicant agent through the leather. The 4 oz can is for emergency use of reimpregnation; the pail is for initial treatment by hot-dip immersion method.

C. DECONTAMINATING APPARATUS, PORTABLE M-2, M11 (fig. 11-1)

A 1 ½ quart container, with pump, that emits a fine spray when discharged.

Source: LIN F-81469

NSN 4230-00-720-1618 Type M11

Use: To decontaminate vehicles or relatively small areas with a fine spray of decontaminating solution.

NOTE: See TM 750-5-15 for other decontaminating apparatus.

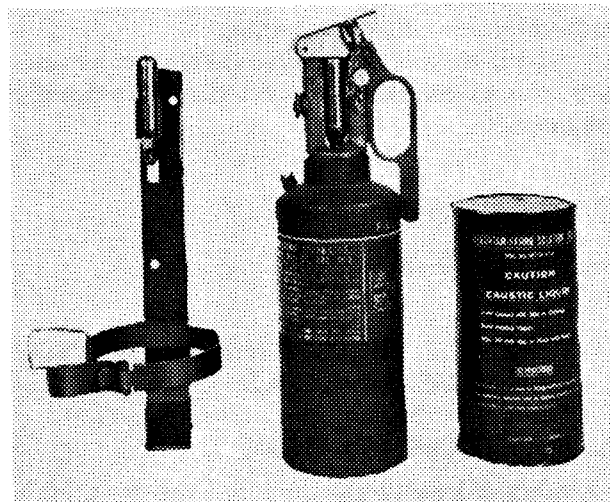


Figure 11-1. Decontaminating Apparatus, Portable M-2, M11.

D. DECONTAMINATING AND REIMPREGNATING KIT, INDIVIDUAL, M13

Containing powder, decontaminating, reimpregnating, dye, cutter, and powder.

Source: LIN F-80857

NSN 4230-00-907-4828

Use: For emergency decontamination of skin, clothing, and equipment exposed to chemical agent or for reimpregnating the protective liner outfit. Follow emergency instructions contained in kit.

E. FILTER UNIT, GAS PARTICULATE (fig. 11-2)

Various filter units are available to remove toxic gases and aerosols from air contaminated with CBR agents and to deliver the purified air to a protective shelter. Essentially these filter units consist of gas-particulate filters, flexible airhoses, and either an electric-motor-driven (EMD), or a gasoline-engine-driven (GED) blower.

Source: LIN H-48911 EMD, ABC-M6
NSN 4240-00-368-6127

Hazard: Gaseous and particulate contaminants immediately dangerous to life.

Limitation: Filter units will not protect against carbon monoxide gas. Do not use filter units as a ventilation system, as this will shorten the life of the filters and, subsequently, endanger life.

Other Precautions: For EMD units, insure that equipment is properly grounded. For GED units, insure that exhaust is vented away from the air inlet hose; exercise care in handling leaded gasoline.

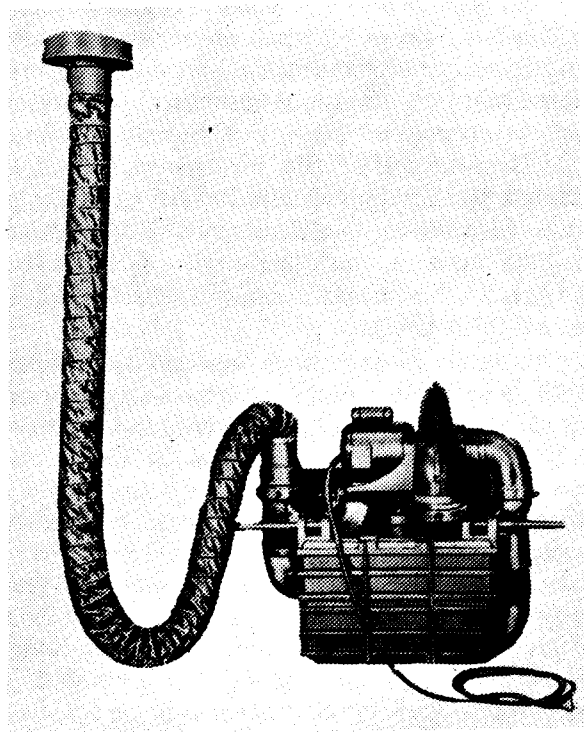


Figure 11-2. Filter Unit, Gas Particulate.

Reference: M6, TM 3-4240-207-12
M6A1, TM 3-4240-241-12
M11, TM 3-4240-210-12
M12, TM 3-4240-211-12

For complete listing and descriptive data, see TM 750-5-15.

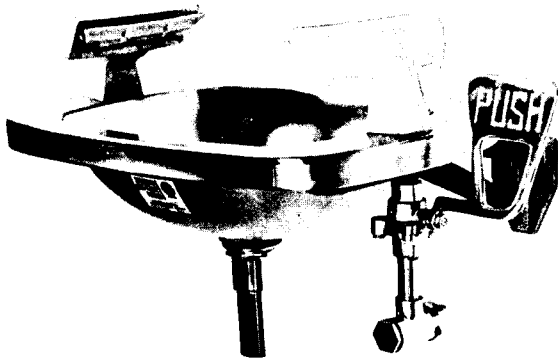


Figure 11-3. Fountain, Eye, and Face, Wash Station.

F. FOUNTAIN, EYE, AND FACE, WASH STATION (fig. 11-3)

For acid- and chemical-removal facilities, a fitted bowl with two low-pressure nozzles and a forehand pressure-release valve for washing the eyes.

Source: Appendix A

Use: By personnel working in operations involving danger of splash from chemicals.

G. GOGGLES, CHEMICAL SPLASH (fig. 11-4)

A ventilated, flexible, vinyl goggle with a



Figure 11-4. Goggles, Chemical Splash.

one-piece replaceable lens and a removable foam filter.

Source: Appendix A

Use: For full eye protection on operations where there is a possibility of chemical splashes.

H. SHOWER, EMERGENCY (fig. 11-5)

A deluge type shower with a manually controlled pull valve.

Source: Appendix A

Use: In laboratories, chemical plants, missile facilities, refineries, foundries, or other locations where there is a danger of clothing fires or of acid, caustic, or chemical splashes or burns.

NOTE: Also see Shower Unit, Safety, Rocket Propellant Neutralizer, in chapter 17, "Special Safety Protective Clothing and Equipment for Handling Fuels."

I. SUIT, RESCUE, ACID (fig. 11-6)

A fully integrated, one-piece, vinyl-coated nylon suit with full-length pressure-tight zipper



Figure 11-5. Shower, Emergency.



Figure 11-6. Suit, Rescue, Acid.

and replaceable gloves, boots, and lens assembly. Color: yellow. May be used with self-contained breathing apparatus.

Source: Appendix A

Use: For protection against acid splash or for rescuing personnel from areas contaminated with acid gases, vapors, or liquid.

J. TEST KIT, IMPREGNITE-IN-CLOTHING, ABC-M2

Source: LIN W-05605
NSN 6630-00-783-8192

Use: To determine qualitatively the impregnate content of permeable protective (impregnated) clothing.

K. VESICANT AGENT, PROTECTIVE OINTMENT, M5

A squeeze tube containing protective ointment.

Source: LIN X-99538
NSN 6850-00-664-3647

Use: Applied to exposed portions of the body for protection against blister gases or to neutralize blister gases after exposure of any part of the body to them. Can be used to decontaminate personal equipment.

Limitation: M5 ointment is harmful to eye tissue; keep away from eyes.

L. WATER TESTING KIT, CHEMICAL AGENTS, AN-M2 (fig. 11-7)

Consists of reagents, glassware, and cleaning equipment.

Source: LIN Y-37267
NSN 6665-00-171-9747

Use: This kit is used in the field to detect contamination of unchlorinated water by chemical agents.

Limitation: A nonquantitative indication; therefore, the degree of contamination is not given. Kit does not detect bacterial contamination nor V-agents in water. See instructions included with kit.

11-5 CLOTHING AND EQUIPMENT FOR CHEMICAL HAZARDS

The items listed below are described in other chapters. Refer to chapter indicated for items not listed or to appendix B, "Safety Item Index."

Apron, Impermeable: Duck, Rubber Coated, Black
LIN A-86590 — Chapter 5

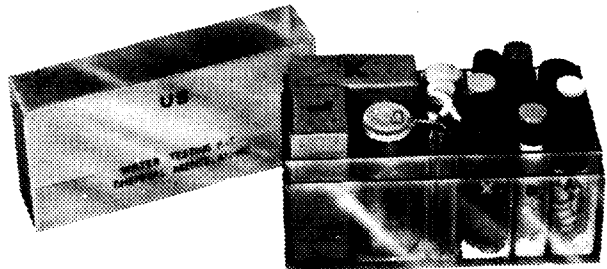


Figure 11-7. Water Testing Kit, Chemical Agents AN-M2.

Boots, Combat: Men's — See para. 11-4, items A. and B.

Boots, Safety: Knee, Rubber, with Safe Toe and Steel Shank
LIN 80601N — Chapter 6

Cap, Clean Room: White, Orlon/Dacron
LIN 81120N — Chapter 4

Cap, Protective, Maintenance Personnel: Powder Shop, White, Drill
LIN 81160N — Chapter 4

Coveralls, Safety, Industrial: Cotton Sateen, White
LIN F-33046 — Chapters 5 and 14

Coveralls, Men's: White, Cotton Sateen, Carded, 8.802
LIN F-32535 — Chapter 5

Coveralls, Safety, Industrial, Fire, Oil, Water, and Chemical Resistant
LIN 81475N — Chapter 5

Coverall, Explosive Handlers
LIN F-31850 — Chapter 14
LIN 81456N — Chapter 14

Cream, Barrier — Chapter 20

Detection Devices as Needed — Chapter 3

Drawers, Men's: Cotton, Thigh Length, White, Elastic Waistband
LIN G-48939 — Chapter 5

Ensemble, Aluminum, Asbestos, Fire Fighters — Chapter 14

Face Shield, Industrial, Nonhinged Window — Chapter 4

Goggles, Chemical Splash — See para. 11-4, item G.

Gloves, Rubber: Acid and Alkali Resistant, Black, Type I
LIN J-69160 — Chapter 7

Gloves, Rubber Gauntlet — Chapter 7

Gloves, Rubber: Organic, Solvent Resistant, Type III
LIN J-69845

Jacket, Safety, Oil and Acid Protective
LIN 84125N — Chapter 5

Leggings, Protective, Knee or Hip Length
LIN 84651N — Chapter 5
LIN 84656N — Chapter 5

Overalls, Safety: Oil and Acid Protective, Bib Type, Infrared Protective
LIN 85856N — Chapter 5

Overshoe, Men's: Rubber, Black, High, Cleated, 5 Buckle
LIN N-39848 — Chapter 6

Respiratory Protection as Required — Chapter 3

Sandal, Strap On
LIN 87112N — Chapter 6

Shirt, Safety, Oil and Acid Protective: Fire and Water Resistant
LIN 87205N — Chapter 5

Shoes, Nonsparking: Traction Tread Sole and Heel, Mildew Resistant
LIN T-08472 — Chapter 6

Shoes, Safety: Clog, Conductive
LIN 87231N — Chapter 6

Spat, Protective — Chapter 6

Suit, Utility: Nylon Coated Both Sides — Chapter 5

Sweatband, Adjustable
LIN 87776N — Chapter 14

Trousers, Safety, Oil and Acid Protective, Fire and Water Resistant
LIN 88265N — Chapter 5

11-6 HAZARDS ASSOCIATED WITH CHEMICALS

If, at times, additional hazards may be encountered, reference should be made to the specific chapter pertaining to that hazard for the selection of appropriate supplementary protective items. For example, if the additional hazard happens to be "Fire Fighting" refer to chapter 14, "Special Safety Protective Clothing and Equipment for Fire, Heat, and Explosion."

11-7 HANDLERS OF CHEMICAL AGENTS AND VESICANT GASES

A. CLOTHING OUTFIT, CHEMICAL PROTECTIVE (fig. 11-8)

Consisting of one CB protective trouser liner, one CB protective shirt liner, three pair protective socks, and one pair protective gloves.

Source: LIN E-40710
NSN 8415-00-782-3240 through 3244 (various sizes)

Use: To provide CB protection to individual soldier. (1) Items are impregnated with modified XXCC3 treatment, which provides CB protection. (2) The outfit, when worn in conjunction with protective mask and hood, and dubbed leather boots or insulated rubber boots, will afford complete protection to the wearer.

Warning: Protective qualities must be maintain-



Figure 11-9. Suit, Chemical Protective.



Figure 11-8. Clothing Outfit, Chemical Protective.

ed. The clothing outfit can be reimpregnated by the individual using the Decontaminating and Reimpregnating Kit, M13, or can be reimpregnated in field laundry operations.

B. SUIT, CHEMICAL PROTECTIVE (fig. 11-9)

Source: LIN U57960

NSN 8415-00-177-5007 and 5008

NSN 8415-00-407-1060 through 1064

Use: Used as overgarment consisting of coat and trousers. Per general chemical laboratory; salvage section and ammunition supply depot where chemical ammunition is handled.

Special Requirements:

- (1) By personnel performing decontamination who must work in close proximity to contaminated areas and equipment.
- (2) By personnel in chemical training.
- (3) By hospital personnel for reception of contaminated patients.
- (4) By personnel loading contaminated clothing into washing machines.
- (5) By individuals and units involved in handling chemical agents and munitions to provide the optimum degree of safety in those instances where the wearing of the toxicological agent protective ensemble is not indicated. Limitations by TSG when the wet-bulb-globe temperature exceeds 75° must be stringently enforced.

11-8 HANDLERS OF TOXIC CHEMICAL AGENTS

The handlers of toxic chemical agents are



Figure 11-10. Handlers of Toxic Chemical Agents, of the type described in Sec. 11-8.

issued a Protective Outfit of the type shown in fig. 11-10.

A. IMPERMEABLE, SUPPLIED AIR, M5

(not issued as a unit)

Source: LIN P-79995

NSN 4240-00-670-5095

B. BOOTS, TOXICOLOGICAL AGENTS PROTECTIVE, M2A1

Source: LIN C-08804

NSN 8430-00-820-6295 through 6306
(various sizes)

C. COVERALLS, TOXICOLOGICAL AGENTS PROTECTIVE: AIR FED, M4

Source: LIN U-58031

NSN 8415-00-818-3564 and 3465

Use: To protect against toxic chemical agents that are immediately dangerous to life. Used by

personnel working in chemical agent plants where toxic chemical agents are manufactured or loaded into munitions or demilitarized. A source of low-pressure breathable air is required. Boots, gloves, and suits are available in various sizes. Impregnated underwear and socks should be worn as additional protection, and air supply monitored for carbon monoxide content or buildup.

D. GLOVES, TOXICOLOGICAL AGENTS PROTECTIVE, M4

Source: LIN J-68475

NSN 8415-00-820-6292 through 6294
NSN 8415-00-820-6305

11-9 HANDLERS OF CHEMICAL AGENTS IN MUNITIONS PLANTS

See item above and ensemble, toxicological agents protective (TAP), chapter 10.

CHAPTER 12. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR CONSTRUCTION AND DEMOLITION

12-1 INTRODUCTION

Construction is a very diversified industry and encompasses a myriad of related activities, each with its own safety hazards. Construction covers such activities as the erection of bridges and buildings; the digging of tunnels, ditches, and excavations; the movement of earth as in blasting; and the grading of roads, railroads and airfields.

Demolition involves the tearing down of existing structures and the removal of materials from the site.

The above activities involve the use of numerous trades and crafts, each with its own or similar exposure to accidents. Proper safety equipment must be selected and issued to the workman according to the hazards of each job. In addition, the workman should be instructed as to the proper use of the equipment issued. The worker should fully understand the safety hazards of his job and respect them.

The most common hazards to safety encountered in construction and demolition are: falling and/or flying objects, which require the use of eye, head, and foot protection; and handling rough and/or heavy materials, requiring the use of proper handwear.

The list below provides a special cross-reference for activity related to construction and demolition:

- Acoustical Environment — Chapter 4
- Air Flow Meters — Chapter 20
- Blasting Equipment and Protection — Chapter 14
- Body Armor — Chapters 5 and 14
- Chemical Handling — Chapter 11
- Clothing for Extreme Temperatures and Weather Conditions — Chapters 5 and 15
- Combustible Gas Indicators — Chapter 14
- Construction Safety Act — Transportation — Chapter 18
- Electrical Equipment and Protection — Chapter 13
- Electromagnetic Radiation — Chapter 16
- Fire Equipment and Protection — Chapter 14
- Fuel Equipment and Protection — Chapter 17

- General Purpose Clothing and Protection for Head, Face, Eye, and Ear — Chapter 4
- General Purpose Clothing and Protection for the Feet — Chapter 6
- General Purpose Clothing and Protection for the Hands — Chapter 7
- Helicopter Operations — Chapter 19
- High Voltage — Chapter 13
- Material Handling — Chapter 19
- Meter, Static — Chapter 14
- Miscellaneous — Chapter 20
- Multimeters — Chapter 14
- Nuclear Environment — Chapter 16
- Ohmmeters — Chapter 14
- Optical Radiation — Chapter 16
- Radiation Protection — Chapter 16
- Respiratory Equipment and Protection — Chapter 3
- Rigging Equipment — Chapter 19
- Safety Belts, Lifelines, and Lifesaving — Chapter 8
- Signs, Signals, and Barricades — Chapter 18
- Transportation Equipment and Protection — Chapter 18
- Vibration and Noise — Chapter 4
- Welding — Chapter 14
- Working in High Places — Chapter 8
- Working over Water — Chapter 8

12-2 SELECTED PORTIONS OF OSHA STANDARDS FOR CONSTRUCTION, PART 1926 — SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION

HAND AND POWERED TOOLS (1926.3002)

Provide the particular personal protective equipment needed to protect employees using hand and power tools and exposed to falling, flying, abrasive, and splashing objects; or exposed to harmful dusts, fumes, mists, vapors, or gases. All personal protective equipment must meet the requirements of these standards and be properly maintained.

This section also specifically mentions that “personal protective equipment” must conform to subpart E.

Under the following heading of this section,

the standards refer to the need that "personal protective equipment" conform to subpart E: fuel-powered tools (1926.302c.2); powder-actuated tools (1926-302e.4); wood-working tools (1926.304).

EXCAVATIONS, TRENCHING AND SHOR- ING (1926.650e)

The general requirements for these operations state that all employees must be protected with personal protective equipment to protect the head, eyes, respiratory organs, hands, feet, and other parts of the body.

TUNNELS, SHAFTS, ETC. (1926.800f)

This paragraph requires that "protective clothing or equipment" must be worn. This covers tunnels, shafts, caissons, cofferdams, and compressed-air operations.

12-3 GENERAL PROTECTIVE CLOTHING AND EQUIPMENT FOR CONSTRUC- TION AND DEMOLITION

The items listed below are applicable for the various occupations pertaining to construction and demolition and are described in other chapters of this pamphlet. Refer to "Safety Item Index."

- (1) Apron, Construction Worker's
- (2) Apron, Impermeable Rubber
- (3) Apron, Welder's, Asbestos
- (4) Belt, Ladder, Safety
- (5) Belt, Safety, Body Type
- (6) Boot, Hip
- (7) Boot, Knee, Safety Toe
- (8) Cap, Protective, Painters
- (9) Ear Muffs or Ear Plugs
- (10) Faceshield, Industrial, Hinged Window
- (11) Glasses, Safety, Spectacle
- (12) Glasses, Sun
- (13) Gloves, Asbestos
- (14) Gloves, Cloth, Coated
- (15) Gloves, Cloth
- (16) Gloves, Leather, Welder's
- (17) Gloves, Leather, Steel Reinforced

- (18) Gloves, Rubber, Gauntlet
- (19) Gloves, Rubber, Natural
- (20) Gloves, Work, Leather Strap
- (21) Goggles, Dust
- (22) Goggles, Chippers and Grinders
- (23) Goggles, Welder's
- (24) Guard, 3-Finger
- (25) Guard, Foot
- (26) Harness, Safety, Industrial
- (27) Helmet, Construction Worker's
- (28) Helmet, Welder's, Fiber
- (29) Jacket, Safety, Welder's
- (30) Leveller, Ladder
- (31) Life Preserver
- (32) Lifelines
- (33) Overalls, Safety, Oil and Acid Protective
- (34) Pads, Knee, Industrial
- (35) Respiratory Protection
- (36) Ring Buoys
- (37) Safety Belts
- (38) Safety Insole
- (39) Shoes, Ladder, Safety
- (40) Shoes, Safety, Industrial
- (41) Shoes, Rubber, Safety Toe
- (42) Signs, Safety
- (43) Skiff, Oar Propelled
- (44) Sleeve, Welder's
- (45) Spat, Protective
- (46) Stepladders

12-4 HAZARDS ASSOCIATED WITH CON- STRUCTION AND DEMOLITION

If at times additional hazards may be encountered, reference should be made to the specific chapter pertaining to that hazard for the selection of appropriate supplementary protective items. For example, if the additional hazard happens to be "electrical," refer to chapter 13, "Special Safety Protective Clothing and Equipment for Electrical Hazards."

NOTE: Construction worker's helmets are recommended for all construction jobs, even though certain job classifications, as such, have limited need for such protection. All persons entering the construction area should be provided with head, eye, and foot protection.

CHAPTER 13. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR ELECTRICAL HAZARDS

13-1 INTRODUCTION

Electrical shock is one of the most common and dangerous hazards that workers may encounter in their daily activities. Each year injuries resulting from contact with energized circuits, either as a result of carelessness or of non-use or improper use of protective equipment, take a huge toll in both hospital expense and lost income.

This section covers activities normally encountered when working on or with electrical energy, requiring protection and insulation for individuals from the hazards of shock as a result of exposure to static charges, grounding, welding (electrical), circuit breakers, switching, power lines, transformers, generators, precipitators, and similar equipment.

Use of special protective clothing and equipment is required when working on all high-voltage electrical appurtenances, power sources, and transmission components. When working with or near any form of electricity, select the most appropriate item from the list of protective clothing and/or equipment included under paragraph 13-3 of this chapter.

For signs, signals, and barricades that may be required in working with electricity, see chapter 18, "Special Safety Protective Clothing and Equipment for Transportation."

13-2 SELECTED PORTIONS OF OSHA STANDARDS — SUBPART S — ELECTRICAL EQUIPMENT AND NFPA OR ANSI STANDARDS

"OSHA requirements for electrical equipment comprise Subpart S of the standards, which basically call for conformance with the National Electrical Code (NFPA 70-1971 or ANSI C1-1971) which is incorporated by reference. The summary below will outline the scope of the standards, what is acceptable equipment from an 'approval' standpoint, and the Code sections that apply to OSHA.

"Application (1910.308)

"a. The National Electrical Code is incorporated by reference into the OSHA standards.

"b. Purpose of the Code is the safeguarding of persons, buildings and their contents from electrical hazards.

"c. Scope: This Subpart S applies to electrical equipment used in or on public and private buildings, structures and premises, including yards, carnivals, parking lots, mobile homes, recreational vehicles, conductors to an electrical supply, and other outside conductors adjacent to premises. But Subpart S does not cover installations on ships, watercraft, railway rolling stock, aircraft, or automotive vehicles; underground mines; railway power supply installations for rolling stock or for signaling and communication; communication equipment controlled by utilities and housed in spaces just for such equipment; and installations controlled exclusively by electric utilities and located in spaces just for such equipment, or outdoors on property owned or leased by the utilities, or outdoors by established rights on private property.

"d. Definitions: Some provisions of the Code require that installations or equipment be 'approved.' 'Approved' means *acceptable* to the Assistant Secretary of Labor for Occupational Safety & Health. 'Acceptable,' as used above, means that the product is accepted, certified, listed, labeled, or otherwise determined to be safe by a nationally recognized testing laboratory such as Underwriters' Laboratories and Factory Mutual Engineering Corp.; or, for installations or equipment not tested by such organizations, inspections or tests by a Federal, state, municipal, or other local enforcement authority for the National Electrical Code; or, for custom-made installations, tested for safety by the manufacturer with test data retained by the employer to show OSHA inspectors.

"National Electrical Code (1910.309)

"The requirements in the following sections of the Code (NFPA 70-1971 or ANSI C1-1971)

apply to all electrical installations and utilization equipment:

"ARTICLES:

"500 Hazardous Locations.
"501 Class I Installations (Hazardous Locations).

"502 Class II Installations (Hazardous Locations).

"503 Class III Installations (Hazardous Locations).

"SECTIONS:

"250-58 (a) and (b) Equipment on Structural Metal.
"250-59 (a), (b), and (c). Portable and/or Cord Connected and Plug Connected Equipment, Grounding Method.

"400-3 (a) and (b) . Flexible Cords and Cable, Uses.

"400-4 Flexible Cords and Cable Prohibited.

"400-5 Flexible Cords and Cables, Splices.

"400-9 Overcurrent Protection and Ampacities of Flexible Cords.

"400-10 Pull at Joints and Terminals of Flexible Cords and Cables.

"422-8 Installation of Appliances with Flexible Cords.

"422-9 Installation of Portable Immersion Heaters.

"422-10 Installation Appliances Adjacent to Combustible Material.

"422-11 Stands for Portable Appliances.

"422-12 Signals for Heated Appliances.

"422-14 Water Heaters.

"422-15 (a), (b), and (c). Installation of Infrared Lamp and Industrial Heating Appliances.

"110-14 (a) and (b) Electric Connection.

"110-17 (a), (b), and (c). Grounding Live Part.

"110-18 Arcing Parts.

"110-21 Marking.

"110-22 Identification.

"240-16 (a), (b), (c), and (d). Location in Premises of Overcurrent Protection.

"240-19 (a) and (b) Guarding of Arcing or Suddenly Moving Parts of Overcurrent Protection Devices.

"250-3 (a) and (b) . D.C. System Grounding.

"250-5 (a), (b), and (c). A.C. Circuits and Systems To Be Grounded.

"250-7 Circuits Not To Be Grounded.

"250-42 (a), (b), (c), and (d). Fixed Equipment Grounding, General.

"250-43 (a), (b), (c), (d), (e), (f), (g), (h), and (i). Fixed Equipment Grounding, Specific.

"250-44 (a), (b), (c), (d), and (e). Nonelectrical Equipment Grounding.

"250-45 (a), (b), (c), and (d). Equipment Connected by Cord and Plug, Grounding.

"430-142 (a), (b), (c), and (d). Stationary Motor, Grounding.

"430-143 Portable Motors, Grounding.

"250-50 (a) and (b) Equipment Grounding Connections.

"250-51 Effective Grounding.

"250-57 (a) and (b) Fixed Equipment Method of Grounding.

"422-16 Appliance Grounding.

"422-17 Installation of Wall-mounted Ovens and Counter-mounted Cooking Units.

Every new electrical installation and all new utilization equipment installed after March 15, 1972, and every replacement, modification, repair or rehabilitation, after March 19, 1972, of any part of any electrical installation or utilization equipment installed before March 15, 1972,

shall be installed or made, and maintained in accordance with the provisions of the 1971 National Electrical Code, NFPA No. 70-1971; ANSI C1-1971 (Rev of C1-1968).

"Rubber Insulating Equipment (1928.951)—a. Equipment must conform to ANSI J6.6-1971 and ANSI J6.4-1971, except that a thinner Class I glove is permitted for telecommunications work. This glove must withstand: 10,000 RMS volts for three minimum proof tests; 16 for maximum proof-test current, ma 14-in. glove; and 17,000 RMS volts for minimum breakdown.

"b. If job is likely to tear gloves, wear heavy outer leather or canvas gloves and use pole insulating devices during pole placing or removing, per 1910.343 k.

"c. Insulating gloves with contrasting color, multi-ply construction aid in detecting cuts, cracks, deep abrasion.

"d. Protective equipment made of material other than rubber must provide at least equal protection.

"e. Employer must periodically retest insulating gloves and blankets, electrically, visually, and mechanically. The retest schedule is:

	Natural Rubber	Synthetic Rubber
New Gloves & Blankets.	.12 months.	.18 months
Re-issued Gloves & Blankets	9 months.	.15 months

"f. Mark gloves and blankets to show compliance with retest schedule and stamp with date next test is due. Gloves found defective in the field or in electrical test must be cut open from finger to gauntlet.

"g. Store unused insulating gloves in glove bags or original containers, and insulating blankets in a canister or other protective device.

"h. Store insulating gloves and blankets away from direct sunlight and heat. Do not fold them, but blankets may be rolled."

Standards for other electrical protective devices:

Item: Rubber matting for use around electrical apparatus

Standard: ANSI J6.7-1935 (R-1971)

Item: Rubber insulating sleeves

Standard: ANSI 6.5-1971

Item: Rubber insulating hoods

Standard: ANSI 6.2-1950 (R-1971)

Item: Rubber insulating line hose
Standard: ANSI J6.1 (R-1971)

13-3 RETEST SCHEDULE FOR RUBBER GLOVES (TM5-682)

- a. (As superseded by C1, 29 Oct 58) *Inspection of Rubber Gloves.*
 - (1) Before putting on rubber gloves, test each glove mechanically for cuts and weak spots. Roll it up tightly beginning at the gauntlet end. Notice if any air escapes through the palm, the thumb, or the fingers of each glove. This usually is called the air "test". Gloves which show weak spots or air leakage in this test must not be used.
 - (2) Turn in rubber gloves to a testing laboratory for electrical tests at least:
 - (a) Once each month when frequently used.
 - (b) Once every 3 months whether used or not.
 - (3) Rubber gloves having any defect whatsoever will be destroyed and a new pair issued.

13-4 SPECIFIC ITEMS FOR PROTECTION AGAINST ELECTRICITY

A. AUTOTRANSFORMER (fig. 13-1)

A self-contained metered unit for controlling voltage in AC circuits, consisting of a voltmeter, live and load terminals, and control switches. Available in various ranges. Some units also contain ammeter.

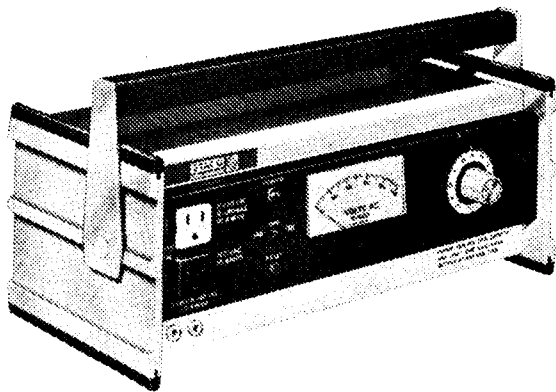


Figure 13-1. Autotransformer.

Source: Appendix A

Use: By electricians, technicians, maintenance personnel, and others working with electrical circuits, motors, ovens, heaters, etc., for adjusting or varying line voltage.

Limitation: Requires AC power source. Not for use with induction motors.

B. BAG, LINEMAN'S GLOVE, FOR GLOVES, RUBBER, VOLTAGE RATING PROOF (fig. 13-2)

A water-repellent duck or canvas bag for holding and protecting lineman's gloves when not in use. May be worn on the belt.

Source: LIN 80535N

Use: For protection of electrician's rubber gloves in storage and in transit.

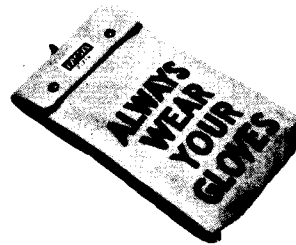


Figure 13-2. Bag, Lineman's Glove, for Gloves, Rubber, Voltage Rating Proof.

C. BLANKET, RUBBER, ELECTRIC LINE

A heavy rubber blanket with protective canister and six clamps for attaching over energized conductors to prevent electric shock.

Source: LIN 80560N

Use: By linemen and other personnel requiring protection against shock or electrocution from energized circuits.

D. BELT, SAFETY, INDUSTRIAL, LINEMAN'S TYPE, WITH SAFETY STRAP

(Also see "Safety Belts, Lifelines, and Life-saving Equipment," chapter 8.)

An adjustable web or leather body belt with tool holders and two "D" rings.

Source: LIN B-60115

NSN 4240-00-595-3028

Use: By electrical linemen, workers stocking crude rubber fiber and cordage, telephone installers, repairmen, and wiremen, MOS 36K, to prevent falls from elevated positions.

E. BOOT, SAFETY: NONMARKING SOLE AND HEEL, NONCONDUCTIVE, 8-INCH

Source: LIN 80603N

Use: For working with electrical equipment on poles or trees.

F. CLAMP, GROUNDING

A screw-type clamp for attaching ground wires to water pipes, rods, conduits, etc.

Source: Appendix A

Use: By electricians, linemen, or technicians for grounding electrical lines or circuits to prevent shock.

G. CLIMBERS, SET, TREE and POLE (fig. 13-3)

An adjustable, metal, leg iron with leather retaining strap and drop-forged gaff and tang, which is attached to the leg for climbing.

Source: LIN E-36227

NSN 4240-00-273-9668

Use: By personnel, such as linemen or forestry workers, whose work requires ascending and descending trees and poles.

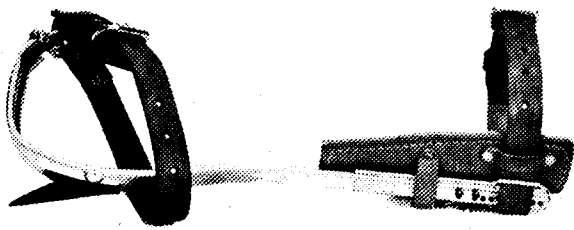


Figure 13-3. Climbers, Set, Tree and Pole.

H. GALVANOMETER, 0-300 OHMS (fig. 13-4)

Foxboro Company or equivalent

A sensitive meter for measuring small electric currents.

Source: Appendix A



Figure 13-4. Galvanometer, 0-300 Ohms
Foxboro Company.

Use: By safety officer to measure small electric currents.

I. GLOVES, LEATHER, MEN'S, LINEMAN'S (fig. 13-5)

A work-type leather glove with gauntlet, cream or gray color.

Source: LIN J-67516

NSN 8415-00-274-2431 through 2434

Use: Worn by telephone installers, wiremen, electricians, and linemen as outer covering to protect rubber gloves.

J. GLOVES, RUBBER, MEN'S, HEAVY-WEIGHT, CLASS I

A black rubber glove, 3,000-volt protection rating, for use without external protection.

Source: LIN J-69982

NSN 8415-00-782-2140 through 2143

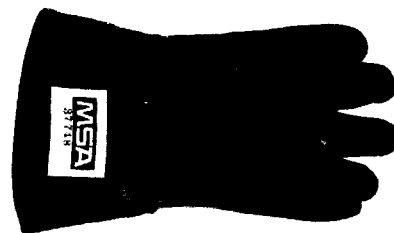


Figure 13-5. Gloves, Leather, Men's, Lineman's.

Use: For working with high-voltage equipment. Worn by medical equipment repairmen, central office equipment repairmen, and electricians; by individual NOA whose duty involves work with high voltage.

K. GLOVES, RUBBER: 3,000-VOLT PROTECTION, CLASS B

A black rubber glove, 3,000-volt protection rating, worn with gloves, leather, lineman's, for external protection.

Source: LIN J-70256

NSN 8415-00-264-2028 size 8

NSN 8415-00-264-2029 size 9

NSN 8415-00-266-8644 size 10

NSN 8415-00-266-8701 size 10-½

NSN 8415-00-266-8645 size 11

Use: For working with medium-high voltages, worn by medical equipment repairmen and electricians.

L. GLOVES, RUBBER: NATURAL RUBBER, ABOVE 3,000-VOLT PROTECTION (fig. 13-6)

A strong, durable rubber glove with high

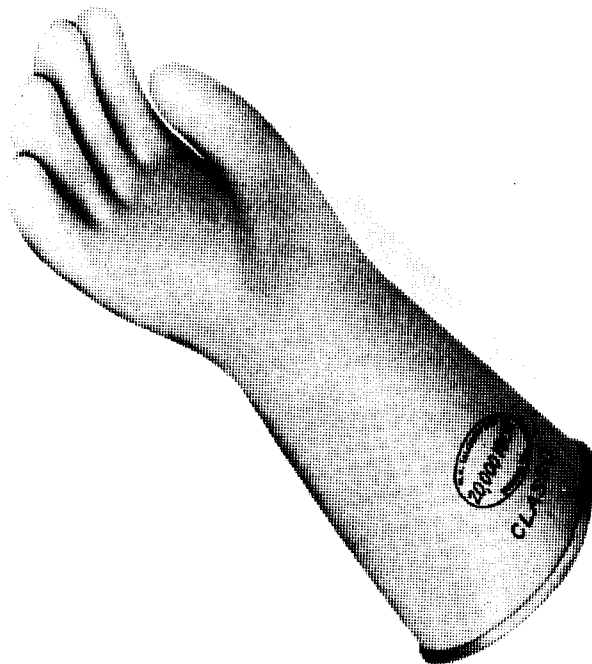


Figure 13-6. Gloves, Rubber: Natural Rubber, Above 3,000-volt Protection.

dielectric strength for protection against electrical shock.

Source: LIN 82915N

Use and Limitation: By personnel working with voltages higher than 3,000 volts.

M. GLOVES, RUBBER: 5,000-VOLT PROTECTION, CLASS 3

Source: NSN 8415-00-266-8691 size 10

NSN 8415-00-255-5004 size 10-½

NSN 8415-00-782-2169 size 9

Use and Limitation: By personnel working with voltages higher than 3,000 volts.

N. GLOVE SHELLS, LEATHER, GAUNTLET TYPE

A gauntlet type glove with five finger sheaths, Gunn cut, brown or cream color.

Source: LIN J-63269

NSN 8415-00-634-4794 size 1

NSN 8415-00-634-4793 size 2

NSN 8415-00-269-5700 through 5702 sizes 3-5

Use: Worn for additional protection over lineman's rubber gloves for high-voltage work.

O. GLOVE SHELLS: LEATHER, CORK COLOR, LINEMAN'S

A pliable leather glove, Gunn cut and cork color, for wearing over rubber lineman's gloves to protect them from physical damage.

Source: LIN J-63406

NSN 8415-00-264-3618

Use: Worn for additional protection over lineman's rubber gloves.

P. GUARD, PROTECTIVE: LEG CLIMBERS, LINEMAN, IRON

A cork or plastic protector that covers the gaff on the climbers set.

Source: LIN 83373N

Use: Issued with lineman's climbers to protect against injury from the gaff when not in use.

Q. HAT, SAFETY, LINEMAN'S

(Also see Helmet, Construction Worker, chapter 4.)

A hard hat with full floating suspension and 10,000 volt electrical resistance.

Source: LIN 83451N

Use: By personnel working in proximity to electrical lines.

R. LINEMAN'S SLEEVE, RUBBER

Source: Appendix A

Use: Insulates the wearer from contact with energized lines. Prevents deterioration of gloves for electricians handling tools or rough objects.

S. MULTIMETER

A multipurpose device for measuring resistance, voltage, or current in various ranges.

Source: LIN M-81037:

0-1000 VDC

0-750 VAC

0-10 AMPDC

NSN 6625-00-270-3776

LIN M-81098:

0-1000 VAC-DC

0-250 MA DC

0-100000 OHM

NSN 6625-00-242-7016

LIN M-82605:

0-1000 VDC

0-750 VAC

0-10 AMP AC-DC

NSN 6625-00-553-0643

Use: By electricians, safety officer, fire department.

T. OHMMETER

A device for measuring electrical resistance.

Source: LIN N-17292:

0 to 1 MEGOHM resistance

1 ½ VDC operating voltage

NSN 6625-00-648-8685

LIN N-17429:

0-200 MEGOHM resistance

500 VDC operating voltage

NSN 6625-00-241-9977

LIN N-17703:

0 to 50000 OHMS resistance

1 ½ VDC operating voltage

NSN 6625-00-240-4612

Use: By electricians, safety officer, or fire department to check resistance of electrical circuits.

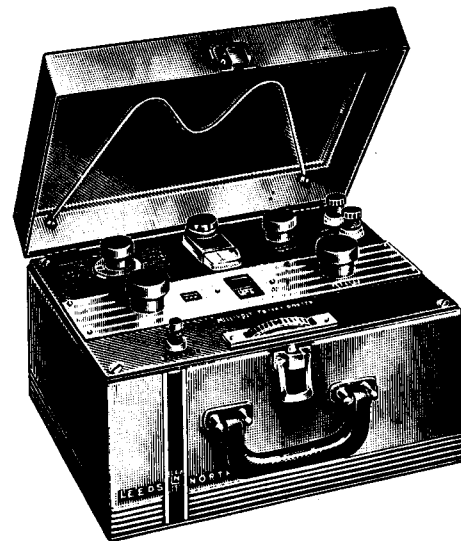


Figure 13-7. Potentiometer.

U. POTENTIOMETER (fig. 13-7)

A portable, battery-operated device used to measure voltage, available in various ranges.

Source: SB700-20, Appendix C
(various types)

Use and Limitation: A device used for the precise measurement of an electromotive force according to voltages stated by the manufacturer.

V. SHOE, SAFETY, LINEMAN'S, NON-CONDUCTIVE

A high-top, leather safety shoe with insulated bottom and neoprene soles and heels.

Source: LIN 87242N

Use: For work on power lines where protection against electrical shock is required.

W. STICK, SWITCH

A long insulating pole made of wood or a synthetic material to permit remote operation of high-voltage switches.

Source: Appendix A

Use: By electricians, linemen, and others for manipulating high-voltage switches from a safe distance.

NOTE: May be used for removal of electrical wires as hazards.

X. SUIT, SWITCHER'S

A lightweight smock and hood of asbestos fabric with wide-vision window and heat-resistant reflective lens.

Source: Appendix A

Use: To protect personnel in high-voltage electrical switching operations from high-voltage arcs.

Y. TESTER, GROUND RESISTANCE

This is a self-contained device for the direct measurement in ohms of resistance to earth.

Source: Appendix A

Use: By electricians, maintenance workers, safety personnel, and others to test the grounded parts of electrical equipment, such as motor frames, switch gear, transformer cases, transmission, power, and lighting arrester ground connections.

Z. TESTER, SHOE CONDUCTIVITY

This device indicates whether or not conductivity is being maintained between the body and conductive floors. It consists of two steps on plates, an indicating dial ohmmeter, and an electrical connection to a 110-volt AC line.

Source: Appendix A

Use: By safety officer, surveillance officer, or other personnel for testing the conductivity of shoes for personnel in hazardous locations where static electricity must be controlled.

AA. TOOL KIT, ELECTRICIAN'S: SET NO. 1

General work tools equipped with rubber or plastic grips for insulation against electrical shock.

Source: LIN W-36977

NSN 5180-00-313-3045

Use: For working near or on electrical lines or equipment.

BB. VOLTMETER, PORTABLE (fig. 13-8)

A portable circuit tester to measure any voltage, either AC or DC, by means of a selector switch.

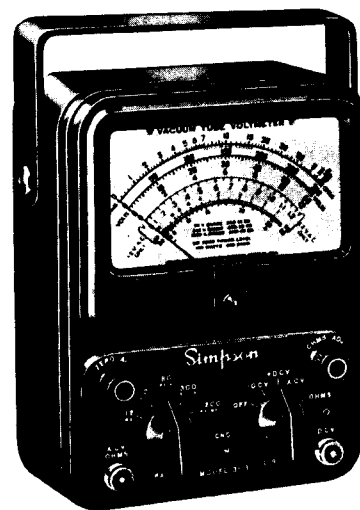


Figure 13-8. Voltmeter, Portable.

Source: SB700-20, Appendix C
(various types)

Use: By safety officer for measuring electrical AC and/or DC voltages.

Limitation: To be used only within ranges specified by manufacturer.

13-5 GENERAL PROTECTIVE CLOTHING AND EQUIPMENT FOR ELECTRICITY

The items listed below are applicable while working with or near electricity and are described in other chapters of this pamphlet. Refer to "Safety Item Index."

- (1) Apron, Welder's
- (2) Belt, Ladder, Safety
- (3) Cream, Barrier
- (4) Floodlight, Portable
- (5) Glasses, Safety, Spectacle Type
- (6) Gloves, Cloth, Men's
- (7) Gloves, Leather, Barbed Wire
- (8) Gloves, Rubber, Gauntlet
- (9) Goggles, Sun, Wind, and Dust
- (10) Insulation Test Set
- (11) Lanyard
- (12) Meter, Static
- (13) Protectors, Army, Extension Type
- (14) Respiratory Protection
- (15) Sleeve, Rubber, Lineman

13-6 HAZARDS ASSOCIATED WITH ELECTRICAL ACTIVITY

If, at times, additional hazards may be encountered, reference should be made to the specific chapter pertaining to that hazard for the selection of appropriate supplementary protective items. For example, if the additional hazard happens to be "Adverse Weather Conditions," refer to chapter 15, "Special Safety

Protective Clothing and Equipment for Extreme Temperature and Weather Conditions."

NOTE: While protective headwear may not be essential for protection against electrical hazards in every instance, it is considered good safety practice to provide such protection in most cases because of the exposure of such workmen to impact-type head injuries from their general occupational environment.

CHAPTER 14. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR FIRE, HEAT, AND EXPLOSION

14-1 INTRODUCTION

Fire represents a triangle—*oxygen, fuel, and heat*. If we remove any one of these elements, combustion cannot be maintained, and the fire is extinguished. The ideal solution to the problem of fires, with their staggering losses in life, material, and property, obviously, is fire *prevention*. But in emphasizing fire prevention, we should not overlook the importance of fire *protection*. Safety campaigns and “no smoking” warnings scattered all through the plant never will prevent all fires. Provision therefore must be made for *protection* against fires that do start.

Further, poor training and shoddy maintenance practices have been responsible for the out-of-control spread of fires despite the best intentions of preventing fires: sprinkler system valves have been turned off, alarm systems can become disconnected, fire doors have been blocked open, extinguishers have been inaccessible, empty, or inefficiently handled by “green” employees, arsonists still pursue their criminal activities, and lives have been lost by blind exits.

Fire protection is becoming even more vital with the increasing use of highly flammable liquids, plastics, chemicals, petroleum byproducts, etc., and the growth of automation with hazardous areas possibly unattended and unsupervised in the event of an incipient fire.

Just as we have the three elements in the triangle of fire, there are also three components in the vital triangle of *fire protection*:

Adequate Equipment: It must be able to do the best possible job in relation to present and potential hazards. An automatic sprinkler system may be required in accordance with National Fire Protection Association Standards; fire extinguishing devices, maintained, plainly marked, and placed in suitable locations for split-second action; hose stations utilizing material of the highest quality; and a completely foolproof and preferably automatic alarm system.

Proper Employee Training: The best equipment on the market will be useless if panic-stricken employees do not know what to do, when, how and why! In any threat of emergency, men on duty should know what to do. Training must be instituted and maintained *well in advance of its need*—for example, when and

how to turn in an alarm, how to use the various types of fire extinguishers, why fire doors should be kept closed at all times, the location of flammable liquids or substances, what to do as part of the plant’s fire brigade, and how to get out as quickly as possible in the event a fire exit is blocked—as well as why such exits should be kept unblocked at all times.

Regular Maintenance: It is just as important to inspect regularly and frequently all fire protection systems and equipment as it is to inspect and maintain all other plant operating equipment. Obviously, there will be no plant to operate if fire protection suffers through lack of proper, systematic maintenance. Maintenance should be the responsibility of a professionally trained individual. To illustrate: Hydrostatic testing of extinguishers should be done in accordance with the code of the National Fire Protection Association.

Just as fire represents a triangle, so does fire *protection*. Remove one of the three sides of the triangle and the whole structure of defense against fire will collapse.

All fires start small and a conflagration is just a little fire that “got away.” Management in any progressive organization recognizes that the responsibility is a fifty-fifty proposition. The safety director or plant operating official will suffer frustration and “tied hands” unless the top echelon provides an adequate budget to do the job. Good fire protection will more than pay for itself in increased savings and safety to life, material, property and production.

SPECIAL NOTE: Due to the potential explosion hazards of fire extinguishers that are operated by inverting, these inversion types are no longer made in the U.S.: soda-acid, foam, water cartridge, and loaded stream cartridge. It is recommended that inversion type units be phased out of use and replaced.

14-2 SELECTED PORTIONS OF OSHA STANDARDS — SUBPART L — FIRE PROTECTION

“Most of the fire protection requirements in the OSHA standards are presented in one section, Subpart L—Fire Protection, which includes

portable fire extinguishers, fixed fire suppression systems, and fire alarm equipment. An additional set of standards for Fire Brigades was "reserved" in the original OSHA standards for development and publication at a later time.

"...Other fire protection requirements found in other Subparts... are: flammable and combustible liquids, spray finishing using such liquids, and dip tanks using such liquids—all from Subpart H, Hazardous Materials; emergency exits from Subpart E—Means of Egress.

"Definitions (1910.156)

"(This section is based on the following National Fire Protection Association standards—NFPA No. 10-1970, No. 13-1969, No. 14-1970, No. 231-1970.)

"Classes of Fire:

"*Class A*—fires in ordinary combustible materials, such as wood, cloth, paper and rubbish.

"*Class B*—fires in flammable liquids, gases, greases.

"*Class C*—fires that involve energized electrical equipment and therefore the extinguishing media must be nonconductive. (When electrical equipment is deenergized, extinguishers for Class A or B fires may be used safely.)

"*Class D*—fires in combustible metals, such as magnesium, titanium, zirconium, sodium, and potassium.

Classes of Portable Fire Extinguishers: Classified for use on specific classes of fire (as above) and rated for relative extinguishing effectiveness at temperatures of at least 70°F, against specific types and sizes of fires as established by the Underwriters' Laboratories Inc.:

"*Class A rating*—wood and excelsior fires, not of a deep-seated nature.

"*Class B rating*—two-inch deep gasoline fires in square pans.

"*Class C rating*—no fire test; but agent must not conduct electricity.

"*Class D rating*—special tests on specific combustible metal fires.

"Degrees of Hazard:

"*Light hazard*—where fires would be small because of small amount of combustible or flammable liquids present, such as offices, schoolrooms, churches, assembly halls, telephone exchanges, etc.

"*Ordinary hazards*—where fires would be of moderate size, such as store storage and display, auto showrooms, parking garages, light manufacturing, warehouses not classed as extra hazards, school shop areas, etc.

"*Extra hazard*—where fires of severe magnitude would be expected because of combustibles or flammable liquids present, such as woodworking, auto repair, aircraft servicing, warehouses with combustibles piled 14 ft. or higher, flammable liquid handling areas, painting, dipping, etc.

"Classes of Standpipe Service: Fire hose systems installed in buildings.

"*Class I*—for use by fire departments and those trained in handling heavy fire streams (2½-inch hose). System supplies fire streams needed for advanced inside fires and for external fire exposures.

"*Class II*—for use primarily by building occupants until fire department arrives (small hose). System is for control of incipient fires by building occupants during working hours and by watchmen at night and on holidays.

"*Class III*—for use either by fire departments and trained crews or by the building's occupants. System provides control of incipient fires by occupants and provides streams for advanced stages of fire inside buildings.

"Types of Standpipe Systems:

"Wet standpipe systems with a supply valve open and water pressure maintained at all times.

"Systems with approved devices that admit water automatically when a hose valve is opened.

"Systems that admit water by manual operation of approved remote control devices at each hose station.

"Dry standpipe systems having no permanent water supply in the piping.

"Types of Storage:

"*Type I*—storage where combustible goods (or noncombustible goods with combustible packaging or storage aids) are stored in solid piles between 15 and 21 ft. high or between 12 and 21 ft. high in piles with horizontal channels (such as air spaces created by pallets). May include small amounts of combustibles with fire ratings above 'ordinary' (see Degrees of Hazard above).

"Type II—storage where combustible goods (or noncombustible goods with combustible packaging or storage aids) are stored up to 15 ft. high in solid piles or up to 12 ft. in piles with horizontal channels (such as pallets). May include small amounts of combustibles with fire ratings above 'ordinary.'

"Type III—storage where stored goods, packaging, and storage aids are noncombustible or contain not enough combustibles capable of producing a fire that could appreciably damage the stored goods or noncombustible types of building construction. It may include ordinary combustible goods sealed in noncombustible containers, but cannot include general storage subject to frequent changing or storage of combustible packaging and storage aids.

"Approved' Equipment:

"'Approved' means listed or approved by: 1. Factory Mutual Engineering Corp. or Underwriters' Laboratories Inc.; or 2. Federal agencies such as Bureau of Mines, Dept. of the Interior, Dept. of Transportation, or U.S. Coast Guard, which issue approvals for such equipment."

14-2.1 SELECTED PORTIONS OF OSHA STANDARDS, PART 1910 – OCCUPATIONAL AND SAFETY STANDARDS – SUBPART H – HAZARDOUS MATERIALS – COMPRESSED GASES

"Subpart H—Hazardous Materials

"§ 1910.101 Compressed gases (general requirements).

"(a) *Inspection of compressed gas cylinders.* Each employer shall determine that compressed gas cylinders under his control are in a safe condition to the extent that this can be determined by visual inspection. Visual and other inspections shall be conducted as prescribed in the Hazardous Materials Regulations of the Department of Transportation (49 CFR Parts 171-179 and 14 CFR Part 103). Where those regulations are not applicable, visual and other inspections shall be conducted in accordance with Compressed Gas Association Pamphlets C-6-1968 and C-8-1962.

"(b) *Compressed gases.* The in-plant handling, storage, and utilization of all compressed gases in cylinders, portable tanks, rail tankcars,

or motor vehicle cargo tanks shall be in accordance with Compressed Gas Association Pamphlet P-1-1965.

"(c) *Safety relief devices for compressed gas containers.* Compressed gas cylinders, portable tanks, and cargo tanks shall have pressure relief devices installed and maintained in accordance with Compressed Gas Association Pamphlets S-1.1-1963 and 1965 addenda and S-1.2-1963."

14-3 OSHA STANDARDS FOR PORTABLE FIRE EXTINGUISHERS

Portable Fire Extinguishers (1910.157)

(This section is based on NFPA No. 10, 1970, Standard for the Installation of Portable Fire Extinguishers.)

a. General Requirements—1. Portable extinguishers must be maintained in a fully charged and operable condition, and kept in their designated places at all times when not being used.

2. Location: Locate them conspicuously where they will be readily accessible and immediately available in the event of fire. Place them along normal paths of travel.

3. Marking of location: Extinguishers must not be obstructed or hidden from view. In large rooms or if units have to be out of view, provide some means of indicating conspicuously the location and intended use of the extinguishers.

4. Marking of extinguishers: If extinguishers for different classes of fire are grouped, mark each one conspicuously for its proper use, so the right kind will be selected.

5. Extinguisher mounting: Install non-wheeled extinguishers on the hangers or brackets supplied, mount in cabinets, or set on shelves.

■ OSHA Proposed Change: next paragraph

6. Height of mounting: Fire extinguishers of less than 40 lbs. gross weight must be installed in accessible manner and in new installations at not over 6 ft. above the floor. Those heavier than 40 lbs. (except wheeled types) must have top within 3½ ft. of floor.

7. Cabinet mounting: When mounted in cabinets, wall recesses or on shelves, have the operating instructions facing outward; and mark the location conspicuously.

8. Vibration: Where there is severe vibration, install extinguishers in brackets specifically designed to cope with the vibration.

9. Temperature ranges: Extinguishers must be suitable for a range of at least plus 40 to 120°F.

10. Extreme temperatures: For temperatures outside this range, extinguishers must be approved or listed for such extremes or be placed in enclosures that stay at the 40-120°F range.

b. Selection of Extinguishers—1. General. Among the factors affecting the selection of extinguishers are: types of fires anticipated, construction and occupancy of the property, hazard or vehicle to be protected, ambient temperature conditions. Approved extinguishers must be used and determine the number of extinguishers required according to paragraph c. below.

2. Selection by hazard: Select according to classes of hazards as follows:

Class A hazards: Select from foam, loaded stream, multipurpose dry chemical, and water types. Note: Certain small multipurpose dry chemical extinguishers are not adequate to earn the minimum 1-A rating for Class A fires and should not be relied on as Class A fire protection even though they can help in smaller Class A fires.

Class B hazards: Select from bromotri-fluoromethane, carbon dioxide, dry chemical, foam, loaded stream, and multipurpose dry chemical. Extinguishers rated less than 1-B are not suitable.

Class C hazards: Select from bromotri-fluoromethane, carbon dioxide, dry chemical, and multipurpose dry chemical. Note: Carbon dioxide extinguishers with metal horns are not suitable for Class C electrical fires.

Class D hazards: Use extinguishers or extinguishing agents that are suitable for the specific combustible metal.

14-3.1 MARKING OF FIRE EXTINGUISHERS

Extinguishers suitable for Class A fires should be identified by a triangle containing the letter "A". If colored, the triangle will be green.



Extinguishers suitable for Class B fires should be identified by a square containing the letter "B". If colored, the square will be red.



Extinguishers suitable for Class C fires should be identified by a circle containing the letter "C". If colored, the circle will be blue.



Extinguishers suitable for Class D fires should be identified by a five-pointed star containing the letter "D". If colored, the star will be yellow.



SPECIAL NOTE: Due to the potential explosion hazards of fire extinguishers that are operated by inverting, these inversion types are no longer made in the U.S.: soda-acid, foam, water cartridge, and loaded stream cartridge. It is recommended that inversion type units be phased out of use and replaced.

14-4 COLOR CODING OF CONTAINERS OF FLAMMABLES (OSHA 1910.144)

The color for all items of this type will be No. 11105 (FED STD-595) with a yellow band No. 13655 (FED STD-595).

14-5 SPECIFIC ITEMS FOR FIRE, HEAT, AND EXPLOSION PROTECTION

A. APRON, WELDER'S, ASBESTOS, LEG LENGTH

(Also see "Protective Body Clothing," chapter 5)

A big type apron made with asbestos fibers. Available in various lengths.

Source: LIN 80272N

Use: By personnel requiring body and leg protection against sustained direct or reflected heat, flames, or sparks.

B. ARMOR, BODY, FRAGMENTATION, PROTECTIVE

(Also see "Protective Body Clothing," chapter 5)

A light-weight metal or plastic type vest for deflecting flying particles.

Source: LIN 80327N

Use: By personnel performing work, which requires upper body protection from flying particles or where there is an explosion hazard.

C. BLANKET, FIRE, WITH CASE: FOR WALL MOUNTING (fig. 14-1)

Source: LIN 80556N

Use: In hazardous location to protect individual on jobs subject to flash fires (for extinguishing flames should clothing catch fire).

D. BLANKET, FIRE: WOOL, WITH GROMMETS AND ROPE HANDLE

Source: LIN B-72362
NSN 4210-00-202-9472

Use: To smother burning clothing; fires in kettles or tanks; or other open conflagrations. For welding to ward off heat and sparks and to shield others from welding rays.

E. BLANKET, FIREPROOF

A cover type wool, fireproof, and flameproof blanket.

Source: LIN 80558N

Use: At firing point on flame-thrower range or to extinguish small ground cover fires.

F. BLANKET, POWDER, COTTON

A flameproof cotton blanket measuring



Figure 14-1. Blanket, Fire, with Case: For Wall Mounting.

approximately 60 × 72 inches with lock-stitch seams.

Source: Appendix A

Use: For covering hot sheet powder during manufacturing process.

G. BLANKET, WOOL, CHEMICAL TREATED

A 60 × 80-inch heavy wool blanket, treated for fire resistance.

Source: LIN 80556N

Use: In chemical division, CRDL laboratory, for use in smothering clothing or equipment fires.

H. BLASTING MACHINE

A compact battery-operated unit carried on belt of blaster. Fires one shot at a time and is so constructed as to prevent accidental firing.

Source: Appendix A

Use: By blaster to detonate explosives safely.

I. BLASTING MACHINE: PLUNGER-OPERATED, WOOD CASE, 50 CAP CAPACITY

Source: LIN B-736977
NSN 1375-00-141-9495

Use: Same as H. above.

J. BOOTS, FIREMAN'S

A black rubber boot with white toe cap, with nonslip, puncture-proof sole, 29-inches high.

Source: LIN C-07708
NSN 8430-00-082-5490 through 5492
NSN 8430-00-147-1032 through 1038
NSN 8430-00-299-0342
NSN 8430-00-753-6105

Use: For regular or auxiliary firefighting.

K. BOOTS, FIREMAN'S, INSULATED (fig. 14-2)

A black rubber boot with white toe cap, with nonslip, puncture-proof sole, knee length or three-quarter length with added insulation.

Source: LIN 80581N

Use: Firefighting operations where protection is required for extended periods in temperatures as low as minus 70° F.

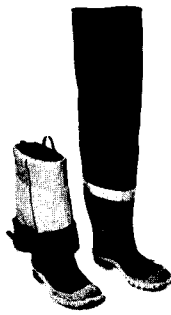


Figure 14-2. Boots, Fireman's, Insulated.

L. BOOTS, FIREMAN'S, RUBBER, KNEE LENGTH, 15-IN. HIGH, ANTISOLE, STEEL TOE

Source: LIN 80583N

Use: By civilian fireman, auxiliary firefighter as required to meet minimum requirements WAB installation commander.

M. BOOTS, FIREMAN'S: RUBBER, BLACK, 13 ½ IN. HIGH

Source: LIN C-07571

NSN 8430-00-753-5938 and 5940

Use: By individual or organization authorized boots LIN C-07708 and requiring the abbreviated boot for use with firefighter clothing under certain conditions or with aluminum asbestos ensemble WABCO.

N. CABINET, STORAGE (fig. 14-3)

A steel storage cabinet with doors to protect contents from accidental ignition and to smother a fire within the cabinet.

Source: Appendix A

Use: For safe storage of relatively small quantities of paints, solvents, and other flammable liquids.

O. CAN, SAFETY, FLAMMABLE LIQUID (fig. 14-4)

A standard safety can with a spring-loaded, self-closing lid, equipped with a flash screen and having only one opening (at top).

Source: Appendix A

Use: For storing and dispensing relatively small

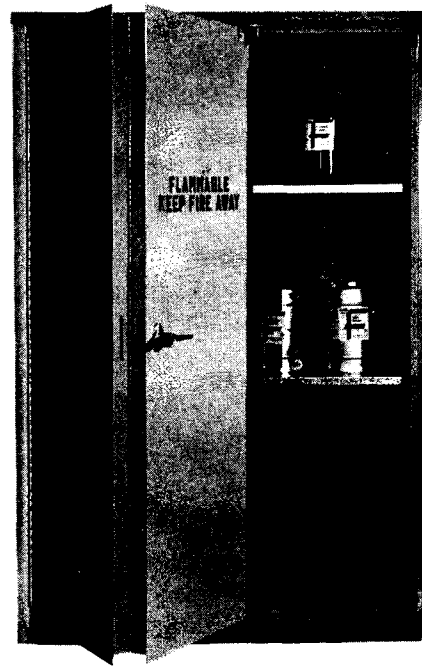


Figure 14-3. Cabinet, Storage.

quantities of solvents and other flammable liquids to minimize any possibility of fire or explosion.

NOTE: See section 14-4.

P. CAP, PROTECTIVE, MAINTENANCE PERSONNEL: POWDER SHOP, WHITE, DRILL

Source: LIN 81160N

Use: For work involving removal of ammunition. Worn as protection and to prevent transportation of explosive dust from work areas.



Figure 14-4. Can, Safety, Flammable Liquid.

Q. CAP, MINER'S

A hard cap with a lamp bracket, cord holder, and adjustable, removable sweatband, seamless, resistant to fracture, nonconductive.

Source: LIN 81136N-(CAP)
LIN 45188N(lamp)

Use: For personnel working in areas susceptible to high concentrations of explosive gases or dust or in smokeless powder magazine.

R. CAP, PROTECTIVE, MAINTENANCE, FLAMEPROOF

An adjustable cotton twill flameproof cap.

Source: LIN 81143N

Use: For personnel working with explosives or flammables.

S. CAP, PROTECTIVE, MAINTENANCE, LEATHER

A soft leather cap in designs for male and female personnel.

Source: LIN 81153N

Use: For protection against flying sparks, etc. ILO, other protective headgear.

T. CAP, PROTECTIVE, MAINTENANCE, WOMEN'S

A soft adjustable fabric cap with a facility for confining and protecting the hair.

Source: LIN 81166N

Use: To protect women's hair when operating equipment or working with explosives: jobs such as female machine operator or female powder handler.

U. CAP, PROTECTIVE, WELDER'S, WITH LUGS FOR USE

An impact protective cap with adjustable suspension.

Source: Appendix A

Use: By welders or maintenance personnel to provide head protection while wearing a welding helmet.

V. CARRIER, EXPLOSIVES (fig. 14-5)

A container to safely carry small amounts of explosives from magazines to blasting site.

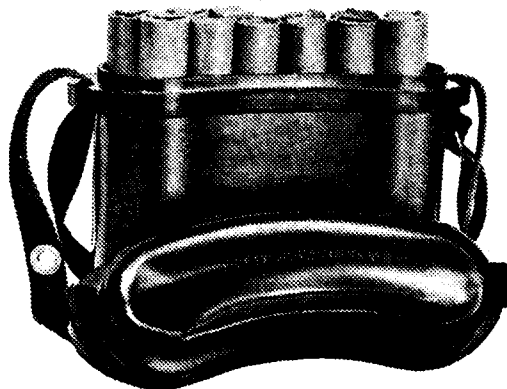


Figure 14-5. Carrier, Explosives.

Source: Appendix A

Use: By blasting crews to transport explosives to blasting site.

Limitation: Explosives and blasting caps should never be carried together.

W. COAT, FIREMAN'S: COTTON SATEEN, OG 107, FIRE RESISTANT/WATER REPELLENT (fig. 14-6)

Source: LIN E-43527

NSN 8415-00-926-1534 through 1538
(various sizes)

Appendix A

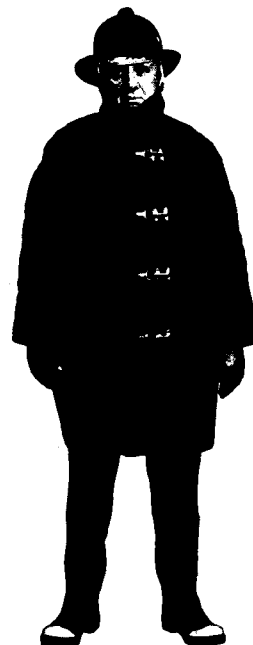


Figure 14-6. Coat, Fireman's: Cotton Sateen, OG 107, Fire Resistant/Water Repellent.

Use: By firefighters, firemen, explosive wash-out crew; QM petroleum depot.

X. COMBUSTIBLE GAS INDICATOR SET, PORTABLE (fig. 14-7)

An instrument operating on the Wheatstone principle to indicate the presence of combustible gas in the range of 0-100 percent LEL.

Source: LIN E-57351
NSN 6665-00-664-4650 M6

Use: By safety officer, gas free inspectors, fire department, engineering department, welders engaged in repairing gasoline tanks, personnel whose work requires periodic testing of bulk propellants, or by medical dispensaries NOA.

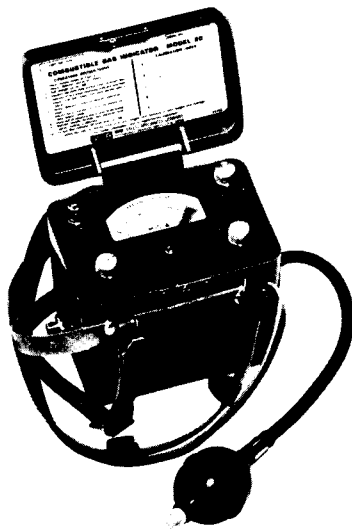


Figure 14-7. Combustible Gas Indicator Set, Portable.

Y. CONVERSION KIT, FOR EXPLOSIMETER NO. 2, FOR USE IN LEADED GASOLINE SERVICE

A head assembly consisting of a top casting, meter, resistance bridge, filament, ballast lamp, sampling line, aspirator bulb connectors, flashback arresters, and flow control orifice.

Source: LIN 51009N

Use: To convert No. 2 Explosimeter to No. 5 type for use with leaded gasoline service.

Z. COVERALLS, EXPLOSIVE HANDLER'S

Cotton sateen, flame-resistant coveralls with shirt-type collar, long sleeve, a lattice hip pocket on right side, and adjustable tabs on sleeves, waist and legs, buttoned, pullman-type fly.

Source: LIN F-31850
NSN 8415-00-279-8719 through 8722 (various sizes)
NSN 8415-00-577-4063 through 4065
NSN 8415-00-809-9400

Use: By personnel engaged in ammunitions operations, per Alpha survey team member, as defined in FM 3-15.

AA. COVERALLS, EXPLOSIVE HANDLER'S: WHITE, POWDER JEAN, CLOSED WAIST, COVER SHOE

A powder jean coverall with one lattice pocket on right hip, rubber buttons, long sleeves closed at the wrists, and cuffless legs that will cover shoe tops.

Source: LIN 81456N

Use: By surveillance inspectors and personnel engaged in operations where explosive or other dust explosion hazards may exist.

BB. COVERALLS, SAFETY, INDUSTRIAL, COTTON SATEEN, WHITE

A white, light-weight, one-piece cotton coverall.

Source: LIN F-33046
NSN 8415-00-782-6366 through 6371

Use: For general work where requirement is for protection against explosions. See chapter 5, "Protective Body Clothing," for other uses.

CC. CURTAIN, WELDING (fig. 14-8)

Made of asbestos, aluminized, or fire-resistant fabric with grommets on edge for mounting. Many sizes and designs.

Source: Appendix A

Use: By welders to enclose a welding area for protection of others from injurious rays and sparks from welding.

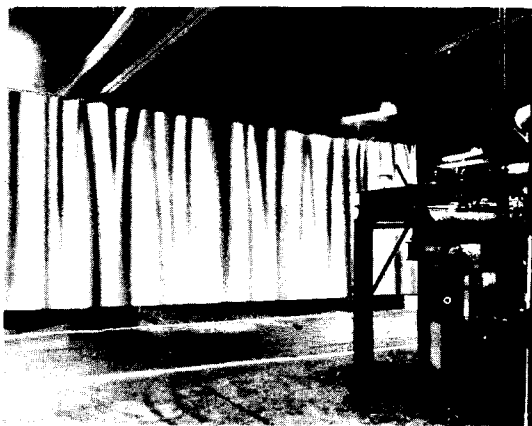


Figure 14-8. Curtain, Welding.

DD. ENSEMBLE, ALUMINUM ASBESTOS FIRE FIGHTER'S CLOTHING (fig. 14-9)

Consisting of (not issued as a unit):

COAT, FIREMAN'S: ASBESTOS, ALUMINUM COATED, FIRE RESISTANT/WATER REPELLENT

Source: LIN E-43483
NSN 8415-00-890-2202 through 2205
(various sizes)

GLOVES, FIREMEN'S: ASBESTOS, ALUMINUM COATED, GAUNTLET CUFF

Source: LIN J-67037
NSN 8415-00-890-2206M and 2207L

HOOD, FIREMEN'S: ASBESTOS, ALUMINUM COATED, FIRE RESISTANT

Source: LIN K-45136
NSN 8415-00-890-2208

TROUSERS, FIREMEN'S: ASBESTOS, ALUMINUM COATED, FIRE RESISTANT/WATER REPELLENT

Source: LIN X-35468
NSN 8415-00-890-2209 through 2212
(various sizes)

Use: By authorized firefighter and auxiliary firefighter when required for more complete protection of firefighting than afforded by other firefighting clothing during extinguishing and rescue work in burning building, ship, or aircraft; member of rescue squad and worker in chemical laboratory or manufacturing plant; worker handling extreme fire-hazardous material, such as pyrophoric fuels.



Figure 14-9. Ensemble, Aluminum Asbestos Fire Fighter's Clothing.

EE. EXHAUSTER, WELDING FUME

A portable exhaustor consists of motor, fan, filters, spark arrestor screens.

Source: Commercial Sources

Use: Removes fumes (such as welding fumes) where stationary venting system is inadequate.

Limitation: Requires 110V or 220V AC power.

FF. EXPLOSIMETER, MSA, MODEL 2A OR EQUIVALENT (fig. 14-10)

An instrument to detect the presence of combustible gases in the range of 0-100 percent LEL.

Source: LIN 51900N

Use: By safety officer and others to detect presence of combustible gases or vapors.

GG. EXPLOSIMETER, MODEL 4, OXYGEN AND ACETYLENE

A combustible gas-detecting instrument fitted with specially designed, heavy-duty flashback arrestors for use in checking suspected oxygen-acetylene mixtures.

Source: LIN 51900N

Use: By safety officer and others to detect the presence of oxygen-acetylene mixtures.

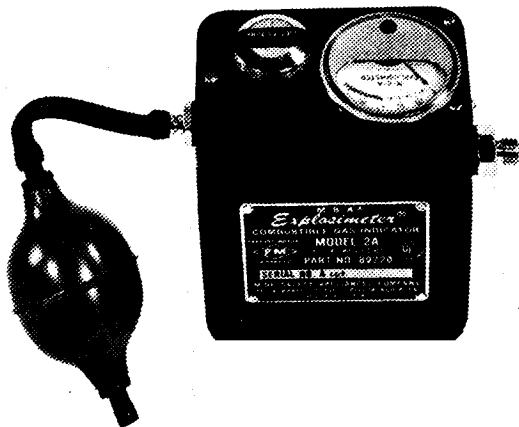


Figure 14-10. Explosimeter, MSA, Model 2A or Equivalent.

HH. EXTINGUISHER, FIRE, CARBON DIOXIDE: CHARGED: HAND, CYLINDER, 15 POUNDS (fig. 14-11)

A portable extinguisher filled with carbon dioxide gas under pressure, equipped with safety locking pin, trigger-type release valve, and discharge horn.

Source: Appendix A
LIN H-22122
NSN 4210-00-202-7858 Also available in smaller or larger capacities.

Use: By firefighters, auxiliary firefighters, and other personnel for extinguishing minor fires. Primarily for use on confined or other flammable liquid fires (Class B) or on electrical fires (Class C).

Warning: Carbon dioxide extinguishers with metal horns are not suitable for Class C electrical fires.

II. EXTINGUISHER, FIRE, MONOBROMOTRIFLUOROMETHANE: CHARGED: HAND, WITH BRACKET, 2.75 POUNDS

Source: LIN H-22396
NSN 4210-00-555-8837

Use: For handling flammable liquid fires in gas stations, laboratories, transportation vehicles, and general industry.



Figure 14-11. Extinguisher, Fire, Carbon Dioxide.

Warning: User should avoid fumes during operation and after extinguishment.

JJ. EXTINGUISHER, FIRE, MULTIPURPOSE, DRY CHEMICAL

Source: Appendix A

Use: These portable extinguishers are approved for use on all standard classes of fire - Class "A", mainly paper and wood; Class "B", burning liquids; Class "C", live electrical fires.

KK. EXTINGUISHERS, FIRE, OTHER TYPES AND CAPACITIES (fig. 14-12)

Source: (1) See CTA 50-970 and SB700-20 for basis of issue and remarks
(2) Appendix A



Figure 14-12. Extinguishers, Fire, Other Types and Capacities.

LL. FLASHLIGHT, SAFETY, EP TYPE (fig. 14-13)

A flashlight with a hard rubber case and lens bezel (nonsparking), so designed that if the lamp is accidentally broken, the lamp base is ejected from its socket, breaking contact with the battery and preventing an explosion if flammable vapors are present.

Source: Appendix A

Use: To provide temporary light in explosive magazines, ammunition depots, ordnance works, or other locations where concentrations of flammables, combustible gases, or explosive vapors may be present.

MM. FLOODLIGHT, PORTABLE, BATTERY TYPE, EXPLOSION PROOF

Handlamp consisting of several wet or dry batteries with large headpiece. Bulb ejects from electrical contact when lens is broken. Circuit fused for safety.

Source: Appendix A

Use: By personnel working in unlighted explosive areas.

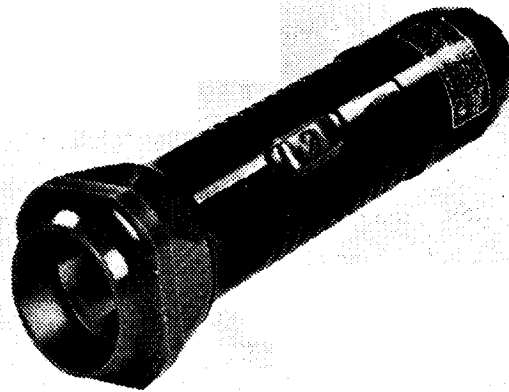


Figure 14-13. Flashlight, Safety, EP Type.

NN. GLOVES, LEATHER, WELDER'S

A cowhide, lined glove, cream or light gray in color.

Source: LIN J-67379

NSN 8415-00-268-7859 and 7860

Use: By welders for protection against heat, sparks, etc.

Limitation: Will deteriorate rapidly at temperatures over 150° F.

OO. GOGGLES, EYECUP, PROTECTIVE, WELDERS

Source: LIN 52520N

Use: By personnel requiring protection against injurious radiant energy. See chapter 4 for other types of eye protection and selection of welding filters.

PP. HELMET, FIREMAN'S: PLASTIC SHELL (fig. 14-14)

Reinforced plastic shell with adjustable shock-absorbing head harness and extended brim for shedding of water.

Source: LIN K-33911

NSN 8415-00-823-7374

Use: By authorized firefighters and auxiliary firefighters as required to meet minimum requirements WAB installation commander. Also used when organizing and training auxiliary firefighters.

NOTE: Helmet, Crash, Motorcyclist's, LIN



Figure 14-14. Helmet, Fireman's: Plastic Shell.

83491N. Chapter 4 can be used by auxiliary fire-fighters to meet minimum requirements WAB installation commander.

QQ. HELMET, WELDER'S: WITH PROTECTIVE FIBER LINER

A tailored leather hood with built-in head harness and filter plate receptacle with lift front.

Source: Helmet: LIN 52770N

Liner: LIN 84701N

Use: By marine welders or other welders working in areas without adequate ventilation, ILO welding helmet.

RR. HELMET, WELDER'S: WITH INSTANT RELEASE ATTACHMENTS

Fiber welder's helmet, less normal suspension, designed to be used with protective cap with welder's lugs.

Source: Appendix A

Use: By personnel engaged in electric arc welding where impact protection for the head is desired.

SS. HOOD, FIRE FIGHTERS GLASS FIBER COVER (fig. 14-15)

Complete with head suspension, chin strap, heat resistant, plastic lens, and shoulder cape. Many sizes and designs.

Source: Appendix A

Use: With fire protection suit where approach must be made to intense heat.

Limitation: Not to be used for fire entry.



Figure 14-15. Hood, Fire Fighters Glass Fiber Cover.

TT. INDICATOR, COMBUSTIBLE GAS, PORTABLE DUAL RANGE WITH PROBE

A dual scale instrument on Wheatstone principle to measure combustible gases in ranges 0-10 percent and 0-100 percent LEL.

Source: LIN K-73831

NSN 6665-00-542-1442

Fed Spec PPP-B-00585A

Use: By safety officer; gas free inspector, fire department, engineer depot, welder engaged in repair of gas tank, individual assigned duty requiring periodic test of bulk propellant, or medical dispensary (H) NOA.

UU. JACKET, SAFETY, WELDER'S, LEATHER

A fire resistant, hip-length jacket for protection against heat, sparks, flames, or molten metal.

Source: LIN 84137N

Use: By personnel on jobs involving contact with sparks and molten metal, such as welders and welders' helpers. NOA protective items for the same purpose.

VV. LAMP, HAND, PORTABLE

Explosion Proof, 1,500 ft beam: Small, bat-

tery powered lamp, with handle. Bulb is on ejector base which will break electrical contact should lens be broken.

Source: LIN 45189N

Use: By personnel required to enter unlighted explosive areas.

WW. LEGGINGS, PROTECTIVE, INDUSTRIAL (fig. 14-16)

Leather, knee-high leggings held in place by steel springs to protect legs of welder from sparks.

Source: LIN L-50863

NSN 8415-00-049-7537

Use: By welders.



Figure 14-16. Leggings, Protective, Industrial.

XX. MAT, BLASTING

Mat constructed of rope or wire cable.

Source: Appendix A

Use: By blaster who places mat over placed explosives to contain the debris normally scattered by an explosion.

YY. METER, STATIC

A portable, battery-powered, self-contained, static-electricity-measuring device.

Source: Appendix A

Use: By personnel required to monitor generation or buildup of static electricity in shoes, slippers, and other conductive equipment.

ZZ. MITTENS, CLOTH, ASBESTOS

An asbestos mitten with wool lining, gauntlet cuff.

Source: LIN M-53377

NSN 8415-266-8843

Use: For handling hot molds or other hot objects and by welders, blacksmiths, heat-treaters, furnace operators, type casters in printing plants, assayers and assayers' helpers.

AAA. OHMMETER, AN/PSM-2

A device for measuring electrical resistance. Also known as insulation test set.

Source: LIN N-17155

NSN 6625-00-581-2466

Fed Spec ZM-21 A/U

Use: By safety officer or fire department personnel.

BBB. PANTS AND SHIRT

Fire resistant synthetic fiber.

Source: Appendix A

Use: For use by male and female personnel when handling or in contact with explosives.

CCC. PLATE, COVER, GLASS, CLEAR

A plain clear 2 X 4 1/4-inch glass plate for protecting the welding plate from weld splatter.

Source: Appendix A

Use: To protect welding filter plate from pitting or splatter from weld.

Limitation: Cover plate is not case hardened and is not intended for impact protection. Not to be used without filter plate.

DDD. PLATE, FILTER, GLASS, SHADES 3 TO 14

A colored glass 2 X 4 1/4-inch plate to eliminate or reduce exposure to injurious rays from welding.

Source: Appendix A

Use: For use in welder's helmets to protect eyes of welder from injurious light rays.

Limitation: Care must be exercised in selecting proper shade for job to be done. See chapter 4, "Protection for the Head, Face, Eye, and Ear." Must always be used with cover plate.

EEE. SHOE, SAFETY, CONDUCTIVE SOLE

(Also see "Protective Footwear," chapter 6.)

Army russet, blucher type, safety toe with spark-proof conductive sole.

Source: LIN 87252N

Use: In areas where static or friction sparks could cause explosion.

NOTE: See "Protective Footwear," chapter 6, for DA policy concerning safety shoes.

FFF. SLEEVE, WELDER'S LEATHER, NATURAL COLOR

Leather sleeves with tie strings, which serve the purpose of holding sleeves on. The strings from each sleeve are passed behind neck of wearer and tied together.

Source: LIN T-72937

NSN 8415-00-164-0513

Use: Protection for upper arms and body from burns and injuries when handling hot and/or heavy materials. Used by welders, blacksmiths, sheet metal workers, sandblasters, and material handlers.

GGG. SUIT, TEAR-OFF (fig. 14-17)

Made of lightweight aluminized glass cloth. Consists of an open back coverall with integral spats, but less gloves.

Source: Appendix A



Figure 14-17. Suit, Tear-off.

Use: Designed especially for handling aluminum alkyls and other similar products that spontaneously ignite upon contact with air at room temperature and give a violent and sometimes explosive reaction in contact with water. Tears off easily.

Limitation: Not to be used for fire entry. Depending on circumstances, a gas mask or self-contained breathing apparatus may be required to provide respirable air.

HHH. SWEATBAND: ADJUSTABLE WHITE

A cloth headband for absorbing perspiration.

Source: LIN 87776N

Use: By laboratory technician and assistant; ammunition handler and powder blender; individual working in extreme heat, which might cause sweat to fall and interfere with operations when handling material that, when combined with water, is made hazardous; individual handling unsealed radiation material or radiation material or radiation contaminated equipment.

III. TROUSERS, FIREMAN'S, OLIVE GREEN, FLAME RESISTANT, WATER REPELLENT

A cotton flannel liner.

Source: LIN X-35673

NSN 8415-00-577-4146 through 4164

Use: By authorized firefighters and trained auxiliary firefighters. Also by auxiliary firefighters as required to meet minimum requirements WAB installation commander.

JJJ. TURBAN, PROTECTIVE HEAD-DRESS, WRAP AROUND, BLUE DENIM, FLAMEPROOF

A length of flameproof, cotton, blue denim cloth that can be wrapped around the head to form a close-fitting cap.

Source: LIN 88456N

Use: By personnel working with explosives or flammables ILO other types headgear for same purpose.

14-6 GENERAL PROTECTIVE CLOTHING AND EQUIPMENT FOR FIRE, HEAT, AND EXPLOSION

The items listed below are applicable for fire fighting and explosions and are described in other chapters of this pamphlet. Refer to "Subject Item Index."

- (1) Adapter, Compressed Air Breathing Apparatus, M-4
- (2) Air Movers
- (3) Coat, Fireman's, Cotton Sateen
- (4) Coat, Nuclear Radiation Protective
- (5) Coveralls, Safety, Fire, Oil Resistant
- (6) Detector Kit, Carbon Monoxide, Colorimetric, M23
- (7) Ear Muffs
- (8) Floodlight

- (9) Indicator, Oxygen Deficiency
- (10) Respiratory protection
- (11) Shirt, Safety
- (12) Shoes, Safety, Conductive Sole
- (13) Shoes, Safety, Nonsparking
- (14) Sweatband
- (15) Tools, Nonsparking.

14-7 HAZARDS ASSOCIATED WITH FIRE, HEAT, AND EXPLOSION

If, at times, additional hazards may be encountered, reference should be made to the specific chapter pertaining to that hazard for the selection of appropriate supplementary protective items. For example, if the additional hazard happens to be "Smoke Inhalation," refer to chapter 3, "Respiratory Hazards and Protection."

TABLE 14-1 CHARACTERISTICS OF FIRE EXTINGUISHERS

TYPE	WATER	PUMP TANK	LOADED STREAM	CARBON DIOXIDE	DRY CHEMICAL		MULTI-PURPOSE DRY CHEMICAL	G-1 POWDER	HALON 1211
	STORED PRESSURE		STORED PRESSURE		CARTRIDGE OPERATED	STORED PRESSURE	CARTRIDGE OR STORED PRES.		STORED PRESSURE
RECHARGE	AFTER USE	AFTER USE	AFTER USE	AFTER USE	AFTER USE		AFTER USE		AFTER USE
OPERATING METHOD	Squeeze Grip	Hand Pump	Squeeze Grip	Squeeze Grip	Squeeze Grip	Squeeze Grip	Squeeze Grip	Pour onto fire	Squeeze Grip
STREAM RANGE	30-40 feet	30-40 feet	30-40 feet	3-8 feet acc. to size	5-20 feet according to size	5-20 feet according to size	5-20 feet according to size	None	Various by size
CAPACITY OR SIZE	1½-2½ gallons	1½ gallons-5 gallons	1-2½ gallons	2-26 pounds	1-30 pounds	1-30 pounds	2½-25 pounds	7, 40 and 350 pounds	2-25 pounds
EXTINGUISHING EFFECT	Cooling and drenching	Cooling and drenching	Cooling and drenching	Blanketing (excludes oxygen)	Blanketing (excludes oxygen)	Blanketing (excludes oxygen)	Blanketing	Depletes oxygen, halts combustion	Blanketing
PROTECTION FROM FREEZING NEEDED?	Water-Type, Yes Anti-Freeze, No	Water-Type, Yes Anti-Freeze, No	None (Operates at 40° below zero F.)	None (Operates at 40° below zero F.)	None (Operates at 40° below zero F.)	None (Operates at 40° below zero F.)	None required	None required	None required
CLASS A FIRES WOOD, PAPER, TEXTILES, ETC.	Yes, Excellent	Yes, Excellent	Yes	No, but will control small fires	No, but will control small fires	No, but will control small fires	Yes, for over 7 pound sizes	No	No, but will control small fires
CLASS B FIRES FLAMMABLE LIQUIDS	No	No	No	Yes, Excellent	Yes, Excellent	Yes, Excellent	Yes	No	Yes, Excellent
CLASS C FIRES ELECTRICAL	No	No	No	Yes, with a non-metal horn, Excellent	Yes, Excellent	Yes, Excellent	Yes	No	Yes, Excellent
CLASS D FIRES FLAMMABLE METALS	No	No	No	No	No	No	No	Yes	No

CHAPTER 15. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR EXTREME TEMPERATURE AND WEATHER CONDITIONS

15-1 INTRODUCTION

There are three primary reasons why clothing is worn: (1) to cover the body, (2) to protect the skin, and (3) to provide a portable climate. The most critical reason for wearing clothing is to make the body sufficiently comfortable so that normal bodily functions can go on even in places where survival would be otherwise extremely difficult.

Under conditions of extreme heat or intense sunlight, clothing should be worn to reflect heat away from the body. The clothing should be light in color, cool, loose, and washable. High temperature is one reason for feeling hot; the other reason is humidity. Moisture in the air makes it difficult to lose body heat and to feel cool. It is recommended that when exposed to high heat and humidity, appropriate preventive measures should be employed to avoid heat related illness and injury. These measures include acclimatization, proper intake of water and salt, appropriate clothing and careful scheduling of work or training. TB MED 175 and DA circular 40-13 should be consulted for details.

Cold weather clothing traps body heat between fabric cells and clothing layers, thereby reducing the loss of heat to the surrounding environment. Cold temperatures combined with high winds increase the likelihood of faster loss of body heat. To compensate for cold and windy conditions, additional insulating undergarments covered by wind-resistant outer clothing should be worn. Care must be taken to prevent overheating thereby causing perspiration, which wets undergarments. Even the best cold weather protective clothing, handwear, and footwear only delays the rate at which body heat is dissipated, especially in inactive situations, and merely extends the time that may be spent in extreme cold environments with minimum risk. The surest way to prevent cold injury is to:

Wear the proper clothing.

Keep the clothing free from dirt and grease, which act as "cold leaks."

Avoid overheating with resultant perspiration.

Keep your clothing dry and use good judgment.

Avoid exposed skin contact with extremely cold metal objects.

NOTE: For additional information, see: TM 10-276 "Hot Weather Clothing and Equipment," and TM 10-275, "Cold Weather Clothing and Equipment." See TB MED 81, "Cold Injury," and TB 288, "Medical Problems of Man at High Terrestrial Elevations," for information on physiological effects of cold injuries.

15-2 SPECIFIC ITEMS FOR EXTREME TEMPERATURE AND WEATHER PROTECTION

A. AXE, ICE, MOUNTAIN

Source: NSN 5110-00-099-0830

Use: By 15 individuals operating in Alpine area NOA.

BOOT INFORMATION: CTA 50-900 states that boot, insulated, cold weather, man's, rubber, black, protective (LIN C-08119); boot, protective, impermeable, (LIN C-08804); and other combat or knee boots do not provide sufficient protection against biological hazards. Cover, footwear, toxicological (LIN F-28473) should be worn in all weather conditions as additional protection, regardless of which boots are worn.

B. BOOTS, COLD WEATHER: MEN'S, RUBBER, BLACK (fig. 15-1)

A black, rubber boot with release valve for high altitude pressures and with sealed insulation.

Source: LIN C-08119

NSN 8430-00-823-7024 through 7083

Use: For individual when required to work in cold chambers at 0° to -20°F.

C. BOOTS, COLD WEATHER: MEN'S, RUBBER, BLACK

Source: LIN C-07982

NSN 8430-00-236-4545 through 4598
(various sizes)

D. BOOTS, EXTREME COLD WEATHER: MEN'S, RUBBER, WHITE (fig. 15-2)

A white, insulated rubber boot with sealed

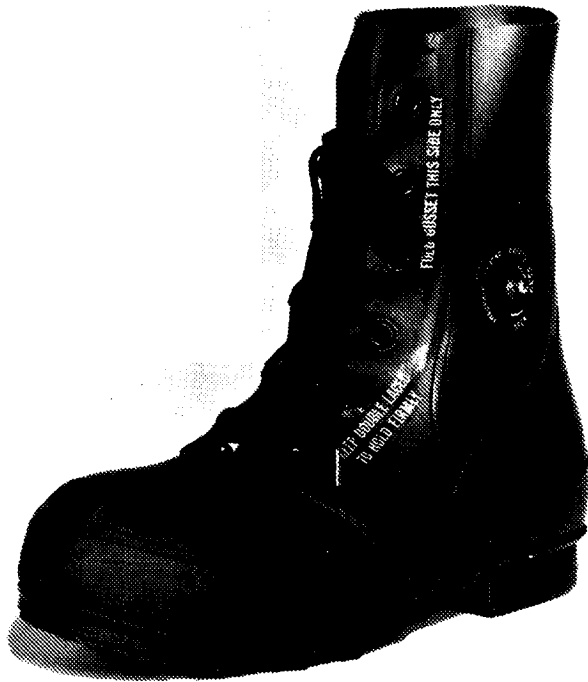


Figure 15-1. Boots, Cold Weather:
Men's, Rubber, Black.

insulation and release valve to counteract the pressures at high altitudes.

Source: LIN C-08256
NSN 8430-00-655-5535 through 5564
NSN 8430-00-823-6902 through 6926

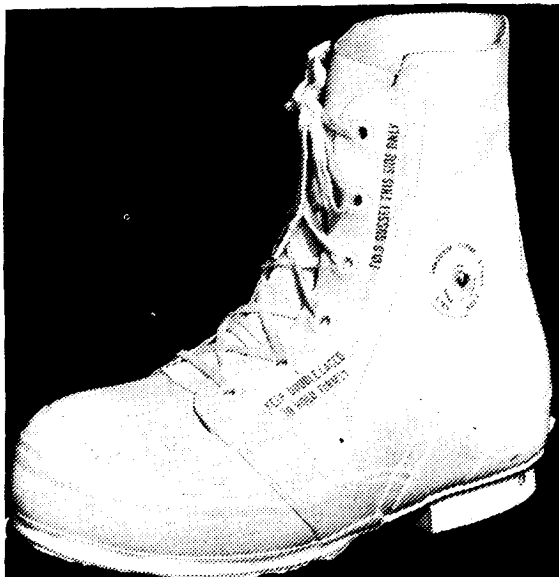


Figure 15-2. Boots, Extreme Cold Weather:
Men's, Rubber, White.

Use: For personnel working in cold chambers where temperature is below -20°F and for protection against cold at high altitudes.

E. BOOTS, HOT WEATHER: MEN'S, LEATHER, AND NYLON DUCK

A mildew-resistant boot, black leather, with direct molded sole and nylon duck uppers with eyelets for ventilation and water drain.

Source: LIN C-07434
NSN 8430-00-889-3567

Use: By personnel in tropical climates as foot protection.

F. BOOTS, HOT WEATHER: MEN'S, LEATHER AND NYLON DUCK, DMS, SPIKE RESISTANT (fig. 15-3)

Source: LIN C-07440
NSN 8430-00-141-0767
(various sizes, chapter 8-SB 700-20)

Use: By individuals, Zones I and II WAB MACOM; WAB sub-MACOM in tropical areas ILO boots LIN C-06749 (Boots, Combat).

Limitation: Not for use by air crews.



Figure 15-3. Boots, Hot Weather:
Men's, Leather and Nylon Duck, DMS,
Spike Resistant.

G. BOOTS, SKI, MOUNTAIN: MAN'S, LEATHER, BLACK (fig. 15-4)

Source: LIN C-09063
NSN 8430-00-458-0135
(various sizes, chapter 8-SB 700-20)

Use: By individual issued ski LIN T-64512,

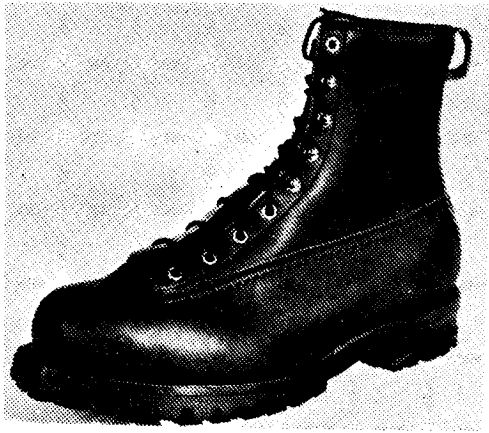


Figure 15-4. Boots, Ski, Mountain:
Man's, Leather, Black.

when required for mountain climbing; arm and service school.

H. CAP, COLD WEATHER: COTTON-NYLON, OXFORD, OLIVE GREEN 107

Source: LIN D-01857
NSN 8415-00-782-2196 through 2921
(various sizes)

Use: In cold storage warehouse, frozen food lockers, or climatic chambers.

I. COAT, COLD WEATHER: MAN'S, COTTON AND NYLON, WIND RESISTANT, SATEEN WITH LINER

Source: Coat:
LIN E-43851
NSN 8415-00-782-2933 through 2945
Liner Nylon:
LIN L-70172
NSN 8415-00-782-2886 through 2890

Use: For protection of personnel working in cold storage warehouses, frozen food lockers, or other cold chambers.

J. COAT, COLD WEATHER: MAN'S, COTTON, WIND RESISTANT, 9 OZ, OLIVE GREEN 107

Source: LIN E-44193
NSN 8415-00-255-8584 through 8591

Use: Army adapted item of material.

K. COAT, COLD WEATHER: COTTON, WIND RESISTANT, SATEEN, OLIVE GREEN 107

Source: LIN E-45152
NSN 8415-00-164-0647
NSN 8415-00-164-5999 through 6010

Use: Army adapted item of material.

NOTE: Three types of liners available for the above cotton and sateen coats.

- (1) Liner, Cold Weather Coat: Mohair Wool Frieze, Natural
LIN L-69967
NSN 8415-00-268-7983 and 7984
- (2) Liner, Cold Weather Coat: Mohair Wool Frieze, Natural
LIN L-70104
NSN 8415-00-261-6591 through 6595
- (3) Liner, Cold Weather Coat: Wool Flannel, Olive Drab, 35
LIN L-70241
NSN 8415-00-170-8287 through 8298

L. COAT, COLD WEATHER: WOMEN'S, COTTON-NYLON, WIND RESISTANT, SATEEN, OLIVE GREEN 107

Source: LIN E-45090
NSN 8415-00-136-5091 through 5100
Hood: Cotton-Nylon WR Sateen,
OG107, Woman's
LIN K-46083
NSN 8415-00-965-2205 Small
NSN 8415-00-965-2206 Medium
NSN 8415-00-965-2207 Large
Liner: LIN L-70378
Wool
Nylon: NSN 8415-00-965-2212
through 2217
Flannel

Use: By female military personnel.

M. COVERALLS, COLD WEATHER, MECHANIC'S, OLIVE GREEN 106

A one-piece garment, lined and insulated with front zipper closure and side openings for access to inner clothing.

Source: LIN F-31439
NSN 8415-00-753-6483 through 6485

Use: Worn over the cold weather uniform by mechanics and other personnel in maintenance, etc., when climatic conditions require.

N. COVERALLS, MEN'S: ARCTIC FOR EXTREME TEMPERATURE

A heavy-weight coverall for use in extreme temperatures.

Source: LIN 81466N

Use: By personnel assigned to climatic chambers requiring protection from extremely cold temperatures.

O. CREEPERS, ICE, STEEL

A sharply spiked outer sole strapped onto the boot to provide safe footing on ice surfaces.

Source: LIN F-45214
NSN 8465-00-240-2953

Use: Provides secure footing on icy ground for personnel who must work in these conditions.

P. CRAMPONS, MOUNTAIN: STEEL, ELECTROGALVANIZED FINISH

Source: LIN F-35316
NSN 8465-00-240-2951 Large
NSN 8465-00-240-2952 Small

Use: Provides secure footing on hard snow and steep slopes.

Q. DRAWERS, COLD WEATHER: MEN'S, 50% COTTON - 50% WOOL KNIT, ANKLE LENGTH, AND UNDERSHIRT

Source: Drawers:
LIN G-49350
NSN 8415-00-904-5119 through 5124
NSN 8415-00-269-5589 through 5592
Undershirt:
LIN X-86839
NSN 8425-00-904-5134 through 5139
NSN 8415-00-197-2887 and 2888

Use: For protection of personnel assigned to climatic or cold-storage chambers.

R. DRAWERS AND UNDERSHIRT, EXTREME COLD WEATHER: THERMAL OR INSULATED

Source: Drawers:
LIN 82145N

Undershirt:
LIN 88657N

Use: By individual regularly assigned to a climatic chamber.

S. DRAWERS, MEN'S: WOOL KNIT, ANKLE LENGTH, AND UNDERSHIRT, SILVER GRAY

Source: Drawers:
LIN G-49213
NSN 8420-00-656-0915
Undershirt:
LIN X-86976
NSN 8420-00-656-0918 through 0920

Use: By engineer diver MOS 7242, OOB.

T. GLOVE INSERTS: ELECTRICALLY HEATED

Source: LIN 82939N

Use: By individual regularly assigned cold room at climatic testing when standard gloves do not meet protection required.

U. GLOVE SHELLS: LEATHER, BLACK, AND GLOVE INSERTS: WOOL AND NYLON KNIT (fig. 15-5, SHELL, AND fig. 15-6, INSERTS)

A leather glove shell worn over the glove inserts, wool knit for protection against cold and wet conditions.

Source: Shells:
LIN J-63269
NSN 8415-00-269-5700 through 5702
NSN 8415-00-634-4793 and 4794
Inserts:
LIN J-62858
NSN 8415-00-682-6575 through 6577
NSN 8415-00-682-6673 through 6674
Mil Spec G-835C

Use: The glove shells are intended for light duty work and mosquito protection and may be worn with or without the wool inserts in cold, wet conditions.

V. HELMET, SUN

A lightweight pith helmet with adjustable chin strap and headband.

Source: LIN K-35007
NSN 8415-00-161-4773



Figure 15-5. Glove Shells: Leather, Black.

Use: To provide protection from direct sun and heat.

W. HOOD, COLD WEATHER: WATER RESISTANT, OLIVE GREEN 107

Source: LIN K-46058
NSN 8415-00-782-3004

Use: By personnel exposed to cold wet weather.

X. MATTRESS, PNEUMATIC: NYLON COATED TWO SIDES, OLIVE GREEN 207

Source: LIN M-17642
NSN 8465-00-254-8887

Use: By individual issued sleeping bag,
LIN T-71615.

Y. MASK, COLD WEATHER, COTTON, OLIVE GREEN 207

A full face mask and neck shield made of vinyl-coated nylon cloth, felt lined, with eye, nose, and mouth openings and adjustable head straps, OG207.



Figure 15-6. Glove Inserts: Wool and Nylon Knit.

Source: LIN M-12169
NSN 8415-00-243-9844

Use: By motorcyclists, drivers of open vehicles, or other personnel assigned to outdoor work in cold temperatures, especially where wind protection is a problem.

Z. MITTEN INSERTS: WOOL AND NYLON KNIT, OLIVE GREEN, TRIGGER FINGER (fig. 15-7)

An insert designed to provide additional warmth and to be worn only under other mittens. Thumb and index finger free to move.

Source: LIN M-52555
NSN 8415-00-160-0769 and 1376

Use: For protection of personnel working in cold storage warehouses or frozen food lockers.

AA. MITTENS: SET, ARCTIC, GAUNTLET STYLE WITH LEATHER PALM (fig. 15-8)

An oversized mitten consisting of outer shell and heavy wool liner, worn over mitten inserts. Mittens have leather palms with a layer of pile fabric covering the back of the hand.



Figure 15-7. Mitten Inserts:
Wool and Nylon Knit, Olive Green,
Trigger Finger.

Source: LIN M-52829

NSN 8415-00-782-6715 through 6717

NSN 8415-00-268-7690 through 7693

Use: For work in cold chambers at 0°F or below; ILO mitten shells, LIN M-53240, and inserts, LIN M-52555.

BB. MITTEN SHELLS: COTTON WHITE

Source: LIN M-52966

NSN 8415-00-261-4827

Use: See CTA 50-900 for basis of issue and remarks.

CC. MITTEN SHELLS: TRIGGER FINGER, LEATHER PALM AND THUMB (fig. 15-9)

Source: LIN M-53240

NSN 8415-00-926-1526 Medium

NSN 8415-00-926-1527 Large

Use: With mitten inserts, LIN M-52555.

DD. PARKA, EXTREME COLD WEATHER: MAN'S, COTTON-NYLON, OLIVE GREEN WITH HOOD

Source: LIN N-69904

NSN 8415-00-782-3216 through 3220

Hood: Cotton-Nylon, OG107

with Fur Ruff



Figure 15-8. Mittens: Set, Arctic,
Gauntlet Style with Leather Palm.



Figure 15-9. Mitten Shells:
Trigger Finger, Leather Palm and Thumb

LIN K-46058
NSN 8415-00-782-3004
Hood: Cotton, OG107,
with Fur Ruff
LIN K-46220
NSN 8415-00-266-7750
Liner: Man's, Nylon Quilted,
OG106
LIN L-70720
NSN 8415-00-782-2881 through 2885

Use: By male and female individual Zones V through VII; individual NOA working in cold storage warehouse or frozen food locker.

EE. PITON, MOUNTAIN TYPE 1 THROUGH 5

Source: See CTA 50-970 for
NSN 1 through 5

Use: By individual participating in mountain training or operations.

**FF. SHIRT, COLD WEATHER: WOOL-
NYLON FLANNEL, OLIVE GREEN 106**

Source: LIN T-04205
NSN 8415-00-188-3791 through 3794
NSN 8415-00-188-3798
(various sizes)

Use: By male individual Zones II through VII;
frozen food locker worker.

**GG. SHIRT, SLEEPING, HEAT RETENTIVE
AND MOISTURE RESISTANT: PULL-
OVER**

Source: LIN T-04685
NSN 8415-00-890-2099 through 2103
(various sizes)

Use: See CTA 50-900 for basis of issue and remarks.

**HH. SHIRT, WOMAN'S: WOOL FLANNEL,
OLIVE GREEN 108**

Source: LIN T-05575
NSN 8410-00-965-2220 through 2226
(various sizes)

Use: By female individual in Zones II through VII.

**II. SHELTER HALF, TENT: COTTON
DUCK, OLIVE GREEN**

Source: LIN T-00150
NSN 8340-00-753-6435

Use: See CTA 50-900 for basis of issue and remarks.

JJ. SKI: MILITARY, ALL TERRAIN

Source: LIN T-64512
NSN 8465-00-823-7216
Binding Ski:
Military, All Terrain:
LIN B-65633
NSN 8465-00-782-3054

Use: See CTA 50-900 for basis of issue and remarks.

**KK. SLEEPING BAG: INTERMEDIATE
COLD**

Source: LIN Z-74138
NSN 8465-00-518-2797

Use: By individual issued sleeping bag, LIN T-74116 below.

LL. SLEEPING BAG: EXTREME COLD

Source: LIN Z-74116
NSN 8465-00-518-2804

Use: See KK above.

**MM. SNOWSHOES: BEAR PAW TYPE, WHITE
ASH FRAME**

Source: LIN T-89390
NSN 8465-00-270-0407

Use: By male individual Zones V through VII
whose duty requires use of this item.

**NN. SNOWSHOES: TRAIL TYPE, WOOD
FRAME**

Source: LIN T-89664
NSN 8465-00-205-1879

Use: By male individual Zones V through VII
whose duty requires use of this item.

OO. SNOWSHOES: TRAIL TYPE, MAGNESIUM FRAME, WITHOUT BINDINGS

Source: LIN T-89527
NSN 8465-00-965-2174
Binding Snowshoe:
Universal Type:
LIN B-65807
NSN 8465-00-965-2175

Use: By male individual Zones V through VII whose duty requires use of this item.

PP. SURVIVAL KIT, INDIVIDUAL: COLD CLIMATE

Contains sleeping bag, parka, trousers, underwear, compass, ration, heater, food pack, waterproof matches, and other survival items.

Source: LIN U-72412
NSN 1680-00-973-1862

Use: Emergency survival in cold climate.

QQ. SURVIVAL KIT, INDIVIDUAL: HOT CLIMATE

Contains fishing kit, compass, survival tools, sunburn creams, mosquito net, water, signaling device, food pack, and other emergency survival items.

Source: LIN U-72549
NSN 1680-00-973-1861

Use: Emergency survival in hot climate.

RR. TENT, ARCTIC, 10 MAN

A pole-supported, six-sided, pyramidal tent fabricated of wind-resistant, cotton sateen cloth. A fire-resistant insulating liner, and a protective cover for the tent and components are provided with the tent.

Source: LIN V-47071
NSN 8340-00-262-3685

Use: Per nomenclature description.

SS. TENT, MOUNTAIN: WITH COMPONENT

Source: LIN V-50359
NSN 8340-00-254-9017

Use: See CTA 50-900 for basis of issue and remarks.

NOTE: For additional tents, see SB 700-20.

TT. TROUSERS, CAMOUFLAGE: COTTON-NYLON, WATER REPELLENT, WHITE

Source: LIN X-35057
NSN 8415-00-935-0567 through 0577
Liner: Nylon Ripstop,
Quilted:
LIN L-71954
NSN 8415-00-935-0546 through 0553

Use: By male military individual Zones V through VII: arm and service school; frozen food locker worker; packing standards office when required for work in cold chamber at 0°F and below.

UU. TROUSERS, COLD WEATHER: COTTON-NYLON, OLIVE GREEN 107

Source: LIN X-35057
NSN 8415-00-935-0567 through 0577
Liner: Field, Mohair, Wool,
Frieze:
LIN L-71885
NSN 8415-00-261-6854 through 6859
NSN 8415-00-269-5483 through 5489

Use: By personnel in pilot back packaging office, when required for work in cold chamber at 0°F or below.

VV. TROUSERS, COLD WEATHER: WOOL SERGE, OLIVE GREEN 108

Source: LIN X-37180
NSN 8415-00-231-7199 through 7213

Use: By male individual Zones II through VII. See CTA 50-900 for other basis of issue and remarks.

WW. TROUSERS, EXTREME COLD WEATHER: COTTON-NYLON, WIND RESISTANT SATEEN

Source: LIN X-36109
NSN 8415-00-782-2948 through 2961
Liner: Arctic, Mohair, Wool Frieze:
LIN L-71748
NSN 8415-00-261-6845 through 6853
Liner: Nylon Quilted, 6.2 oz, OG106
LIN L-72022
NSN 8415-00-782-2922 through 2930

Use: By male individual CONUS, EUROPE, KOREA, and ALASKA; ARWG male individual Zones II through VII WAB State AG. See CTA 50-900 for other basis of issue and remarks.

**XX. TROUSERS, HOT WEATHER: COTTON,
WIND RESISTANT, POPLIN**

Source: LIN X-36632

NSN 8415-00-935-3302 through 3313

NSN 8415-00-082-6148 through 6150

Use: See CTA 50-900 for basis of issue and remarks.

**YY. UNDERSHIRT, EXTREME COLD
WEATHER: THERMAL OR INSULATED**

Source: LIN 88657N

Use: By individual regularly assigned to climatic chamber.

**ZZ. UNDERSHIRT, MAN'S: 50% COTTON,
50% WOOL, FULL SLEEVES**

Source: LIN X-86839

NSN 8415-00-904-5134 through 5139
(various sizes)

Use: By EM Zones VI and VII; frozen food locker worker; individual regularly working in a cold storage plant; meat cutter; individual on flying status.

**AAA. UNDERSHIRT, MAN'S: WOOL KNIT,
SILVER GREY**

Source: LIN X-86976

NSN 8420-00-656-0918 through 0920
(various sizes)

Use: By marine diver MOS 7242, OOB.

**BBB. WET-BULB GLOBE TEMPERATURE
KIT**

Consists of a carrying case containing rod, bracket, black globe, thermometers, a wick, clip, water bottle and flat black paint.

Source: Appendix A

Use: For determining the wet-bulb temperature heat index (WBGT) at locations where troops are exposed to extreme temperatures.

NOTE: See TB MED 175 "Prevention of Heat Exhaustion, Cramps, and Stroke."

CCC. WIND-MEASURING SET: AN/PMQ-3

Source: LIN Y-54680

PMQ-3A NSN 6660-00-515-4339

PMQ-3C NSN 6660-00-592-9002

PMQ-3D NSN 6660-00-964-8913

Use: By safety or surveillance officer to measure wind velocity and direction. For other types see SB700-20.

**DDD. WINTERIZATION KIT, FIELD, PRO-
TECTIVE MASK, M4
WINTERIZATION KIT, TANK, PRO-
TECTIVE MASK, M3
WINTERIZATION KIT, PROTECTIVE
MASK, M1**

The M4 kit consists of an ice-particle pre-filter, which fits under the chin of the mask, and winterizing valve disks. The M3 consists of a fog preventing eyelens outsert, an insulating jacket, and an antiglare eyelens outsert. The M1 consists of a hood, insulating lenses, antiglare lenses, a cheekpad, and valve disks.

Source:

M4

LIN Y-56385

NSN 4240-00-065-0319

M3

LIN Y-56943

NSN 4240-00-066-0181

M1

LIN Y-56317

NSN 4240-00-321-2080

Leftside canister

NSN 4240-00-542-5607

Rightside canister

Use: To make protective masks wearable in sub-freezing temperatures where frostbite and fogged lenses are a hazard.

Limitation: Fitting and installation as outlined in applicable technical manuals should be followed.

Reference: M4-TM 3-4240-202-14

M3-TM 3-4240-219-15

TM 3-4240-223-14

TM 3-4240-255-14

M1-TB 3-205-2

**15-3 GENERAL PROTECTIVE CLOTHING
AND EQUIPMENT FOR EXTREME
TEMPERATURES AND WEATHER**

The items listed below are applicable to extreme temperature and weather conditions and are described in other chapters of this pamphlet. Refer to "Subject Item Index."

- (1) Antifogging Kit
- (2) Blanket, Wool
- (3) Boot, Knee, Man's
- (4) Drawers, Undershirt, Thermal
- (5) Glasses, Sun
- (6) Goggles, Sun, Wind, and Dust
- (7) Hat, Protective, Aluminum
- (8) Hat and Mosquito Net
- (9) Liner, Helmet, Construction Worker
- (10) Raincoats

15-4 PROTECTIVE OINTMENTS AND CREAMS

See chapter 20 and appendix A for skin

creams, cold- and warm-weather chapstick, sunscreen and sunburn ointments.

15-5 HAZARDS ASSOCIATED WITH EXTREME TEMPERATURES

If, at times, additional hazards may be encountered, reference should be made to the specific chapter pertaining to that hazard for the selection of appropriate supplementary protective items. For example, if the additional hazard happens to involve "Chemicals," refer to chapter 11, "Special Safety Protective Clothing and Equipment for Chemical Hazards."

CHAPTER 16. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR PROTECTION AGAINST RADIANT ENERGY

16-1 INTRODUCTION

The Occupational Safety and Health Act standards specifically exempt OSHA enforcement of any operations coming under the authority of the U.S. Nuclear Regulatory Commission and State agencies acting under Section 274 of the Atomic Energy Act of 1954, as amended.

Subpart G - Occupational Health and Environmental Control does include a chapter on ionizing (1910.96) and nonionizing radiation (1910.97). Because of the specialized nature of the subject, these OSHA standards for radiation are somewhat cursory. They define various radiation terms and outline the exposure limits for individuals, limitation on airborne contamination, monitoring of personnel, specifications for radioactivity warning signs and labels, evacuation alarm systems, exceptions for sign posting requirements, shipping package exemptions from conformance to the Department of Transportation requirements, instruction of personnel, storage of radioactive materials, notification of incidents, reports of overexposure and excessive radiation levels, recordkeeping, compliance by firms licensed by Federal and State atomic energy bodies, and radiation standards for mining.

With the exception of laser and maser radiation, the hazards of radiant energy are generally well known.

Radiant energy can be broadly classified into two basic types:

1. Ionizing radiation
2. Nonionizing radiation.

Ionizing radiation includes alpha, beta, gamma, X-rays, neutrons and protons. Radiations of this type are hazardous because of their ionizing ability and the resultant destructive effect on living tissue. Radioactive elements occurring in nature, manmade radioisotopes, X-ray machines, or particle accelerators are all sources of ionizing radiation.

The hazard can be either external (specifically from the emitted radiation) or internal, such as results from radioactive contamination which physically contacts and gains entrance

into the body through the skin, lungs, or by oral ingestion.

Protection from external radiation can be attained by exercising any one or a combination of the following three measures:

- a. Limiting the time of exposure.
- b. Maintaining a suitable distance from the source of radiation.
- c. Shielding the source of radiation with appropriate shielding material.

Special protective clothing may also be worn by individuals who might be exposed to sources of external radiation, but will afford only limited protection and should not in any sense be considered as a substitute for the three basic protective factors mentioned above.

Protection against radioactive contamination generally requires impermeable protective clothing and respiratory protection to prevent entrance into the body and/or contact with exposed skin.

In addition to the above protective measures, it is good practice for anyone exposed to ionizing radiation to wear a film badge and/or a pocket dosimeter so that the immediate or cumulative degree of exposure can be checked periodically.

Nonionizing radiation includes electromagnetic radiation with wave lengths longer than those of x-radiation, including laser, infrared and ultraviolet radiation.

Infrared and ultraviolet radiations may be encountered as a result of exposure to heat sources, the sun, and/or certain welding operations or other sources of intense light. Protection generally includes special body clothing, gloves, boots, hoods, etc., and filter-type lenses for the eyes.

Laser radiation may be hazardous and extreme care should be taken to avoid direct exposure to emitted beams or their reflections. The eyes are especially vulnerable to damage by high intensity laser beams, and special goggles (see M, fig. 16-4) are available for eye protection. In some cases additional safeguards are necessary to avoid skin exposure.

Other items of clothing for protection against radiation hazards are contained in chapters 5, 10, and 11.



*Figure 16-1. Blanket, Nuclear Radiation Protective.
(Lead Blankets)*

16-2 SPECIFIC ITEMS FOR RADIANT ENERGY AND LIGHT ENERGY PROTECTION

Caution: Limitation - All of the items listed below are to be used only by or under the supervision of qualified persons.

A. BADGE, FILM

A photodosimetric device consisting of a film packet in a holder. The holder normally includes a means of attachment to the wearer's clothing.

Source: Lexington Blue-Grass Army Depot or Sacramento Army Depot

Use: To indicate degree of radiation exposure.

B. APRON, NUCLEAR RADIATION PROTECTIVE

(Also see Ensemble, Toxicological Protective, chapter 10.)

A full-length, heavy apron made of leaded rubber.

Source: Appendix A

Use: By personnel on jobs requiring protection from X-rays and/or beta radiation or ultraviolet rays.

C. BLANKET, NUCLEAR RADIATION PROTECTIVE (fig. 16-1 LEAD BLANKETS)

A full-length heavy blanket made of leaded rubber.

Source: Appendix A

Use: By personnel on jobs requiring protection from X-ray and/or beta radiation or ultraviolet rays.

D. BOOT, RADIATION

A high top, neoprene, rubber, or vinyl boot with side buttons at top, worn over regular shoes; colors black or yellow.

Source: LIN 80598N

Use: For protection against exposure to radioactive contamination.

E. CALCULATOR SET, RADIAC AND NUCLEAR YIELD: ABC - M28A1 (fig. 16-2)

Consists of an ABC-M1A1 radiac calculator

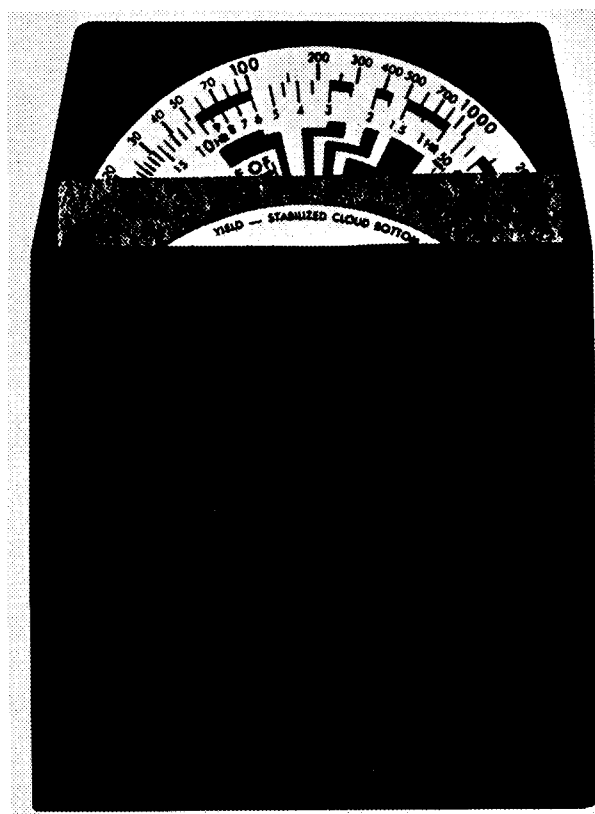


Figure 16-2. Calculator Set, Radiac and Nuclear Yield: ABC - M28A1

and an M4A1 nuclear yield calculator packaged in a plastic envelope.

Source: LIN C-72000

NSN 6665-00-130-3616

Use: By personnel required to make rapid and accurate calculations of radiation hazards resulting from radioactive fallout and nuclear yield from a nuclear blast.

F. CALIBRATOR, RADIAC AN/UDM-6 (fig. 16-3)

A device used to calibrate alpha-radiation-detecting instruments.

Source: LIN C-74507

NSN 665-00-767-7497

Use: By TOE organizations authorized radiac sets, AN/PDR-54 or AN/PDR-60, TA organizations authorized from one to five radiac sets AN/PDR-54 or AN/PDR-60, or organizations required to maintain the radiac set AN/PDR-54 or AN/PDR-60.

Reference: TM 3-6665-203-10

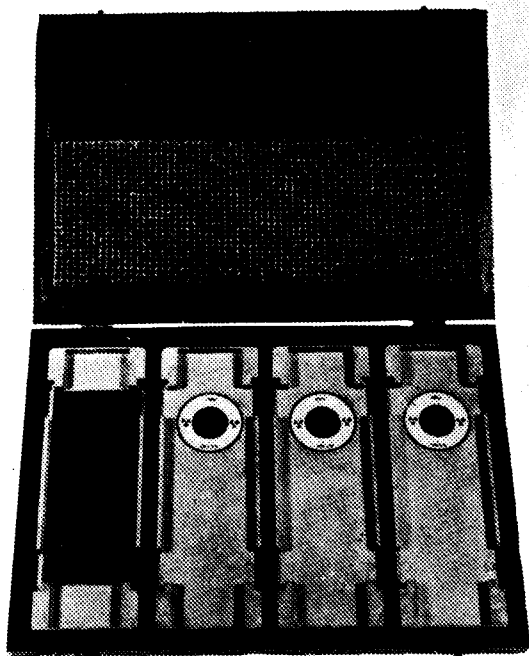


Figure 16-3. Calibrator, Radiac AN/UDM-6.

G. CALIBRATOR, RADIAC, TS-784/PD

A device used to calibrate radiation detecting instruments.

Reference: TM 11-6665-204-50

Source: LIN C-74644

NSN 6665-00-692-6601 TS 784/PD

NSN 6665-00-752-7790 TS 784A/PD

H. CHARGER, RADIAC DETECTOR, PP-1578/PD

A compact portable unit in a case for charging direct-reading, pocket-type dosimeters.

Reference: TB 11-6665-215-12/1

Source: LIN E-00533

NSN 6665-00-542-1177

Use: By personnel in ordnance ammunition, maintenance, and survival schools, and by members or instructors of radiological teams, and by TOE units authorized one or more dosimeters.

I. COAT, NUCLEAR RADIATION PROTECTIVE: FIRE, OIL, WATER, CHEMICAL RESISTANT

A special coat made of spun lead-glass fabric or from leaded plastic or leaded rubber to afford protection against radiation.

Source: LIN 81435N

Use: By personnel on jobs requiring protection from X-ray and/or beta radiation or ultraviolet rays; or heat, flames, sparks, water, oil, grease, alkalis, salts, acids, etc.

J. COVERALL, NUCLEAR RADIATION PROTECTIVE

A special coverall made of spun lead-glass fabric, leaded plastic or leaded rubber, to afford protection against radiation.

Source: Appendix A

Use: For jobs requiring protecting against X-ray and/or beta radiation or ultraviolet rays.

K. COVERALLS, SAFETY, INDUSTRIAL: FIRE, OIL, WATER, CHEMICAL RESISTANT

Source: LIN 81475N

Use: Per individual on job involving exposure to or hazardous contact with sparks, molten metals, flames, radiant heat, explosives or flammables, flying particles, oils, greases, acid vapor from acids, chemicals, steam, irritating, or other hazardous dusts. Per member CBR team having alpha survey mission.

L. GLOVES, X-RAY PROTECTIVE PLASTIC

Special lead-impregnated gloves, cotton lined, with either plain or gauntlet cuff for protection against radiation.

Source: NSN 6532-00-926-8920 Med.

Use: By medical, industrial, and radio-chemical laboratory technicians for protection against the hazards of X-ray and other types of radiation.

M. GOGGLES, LASER (fig. 16-4)

A standard, monocular-type welding goggle with adjustable headband and fitted with a special filter lens for protection against laser beams.

Source: Appendix A

Use: By technicians, research workers, and others who are working with or who might be exposed to high-intensity laser beams, either direct or reflected.

Reference: TB MED 279

Limitation: Laser lenses and/or filters are spe-

cific for certain narrow bands, and extreme caution must be exercised in selecting the proper one for the particular wave lengths under consideration; otherwise, little or no protection will result. Also, Laser Goggles are intended only to complement other laser hazard-control procedures and should not be relied on to give complete protection from either direct or reflected laser beams. They should never be used for direct viewing.

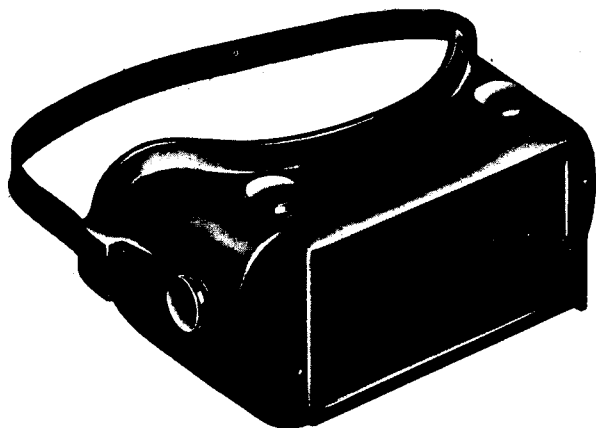


Figure 16-4. Goggles, Laser.

NOTE: See Laser Protection, paragraph 16-5 of this chapter.

N. GOGGLES, MELTER'S, BLUE LENSES (several densities) (fig. 16-5)

(See Head, Face, Eye and Ear Protection, chapter 4.)

A rugged wire-frame goggle with extra-long temples and blue lenses.

Source: Appendix A

Use: For protecting the eyes while looking at molten metal to determine condition.

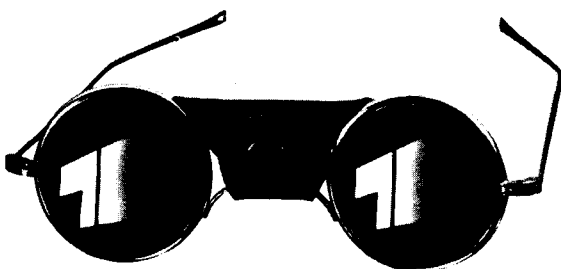


Figure 16-5. Goggles, Melter's Blue Lenses (several densities)

O. METER, SURVEY, GM TYPE, BETA-GAMMA

A battery-powered meter for general survey work with either hand-type or integrated probe, headphones, and visual scale. Will respond to beta and/or gamma radiation.

Source: Appendix A

Use: By personnel required to make radiological surveys, check clothing and/or apparatus for radiation, locating small spills of radioactive materials, following tracer elements, etc.

P. METER, SURVEY, PC TYPE, ALPHA

A battery-powered meter utilizing a proportional counter to detect Alpha particles in the presence of other radiations. Equipped with headphones and/or integrating count rate meter circuit and indicating scale.

Source: Appendix A

Use: By personnel charged with the responsibility for health monitoring in nuclear work.

Q. PORTABLE PULSE COUNTER

An instrument that measures pulses emitted by radioactive material or electrical sources.

Source: LIN 55920N

Use: For use in determining radioactivity or as a counting device where electrical pulses can be monitored.

R. RADIACMETER, IM-9E/PD

A direct-reading, pocket-type dosimeter for measuring total integrated dose received by an individual exposed to gamma type radiation. Range 0-200 mr.

Reference: TM 11-6665-214-10

Source: LIN Q-20798

NSN 6665-00-243-8199

Use: By radio and/or X-ray technicians, personnel handling radio isotopes, medical equipment repairmen MOS 35 G or civilian equivalent, medical equipment maintenance officers MOS 202, members of CBR survey teams required to enter contaminated areas NOA, and any personnel required to enter where radiation is present.

S. RADIACMETER, IM-93/UD

A direct-reading, pocket-type dosimeter for

measuring total integrated dose received by an individual exposed to gamma type reaction. Range 0-600 r.

Reference: TM 11-6665-207-20P

Source: LIN Q-20935

NSN 6665-00-530-1210 IM-93

NSN 6665-00-752-7759 IM-93A

T. RADIACMETER, IM-147/PD

A direct-reading, pocket-type dosimeter for measuring total integrated dose received by an individual exposed to gamma type radiation. Range 0-50 r.

Reference: TM 11-6665-207-35P

Source: LIN Q-21209

NSN 6665-00-542-0729

Use: By members of CBR team required to enter high-radiation areas NOA, or by work groups required to enter high-radiation areas. Per PLUCON.

U. RADIACMETER, IM-174/PD

An area-type survey meter for measuring the dosage rate given off by a source of gamma radiation. Range 300-500 r per hour.

Reference: TM 11-6665-213-12

Source: LIN Q-21483

NSN 6665-00-999-5145 IM-174A

NSN 6665-00-856-8037 IM-174/PD

Use: By escort team of chemical-technical escort unit work groups requiring radiation-monitoring protection, CBR survey parties or installations having a radiation protection officer assigned.

V. RADIACMETER, IM-156/PD

Reference: TM 11-6665-207-35P

Source: LIN Q-21346

NSN 6665-00-691-3065

W. RADIOACTIVE SOURCE SET, M3A1 (fig. 16-6)

A cobalt 60 radioactive source assembly and radioactive source handler in a carrying case.

Source: LIN Q-93303

NSN 6665-00-856-8235

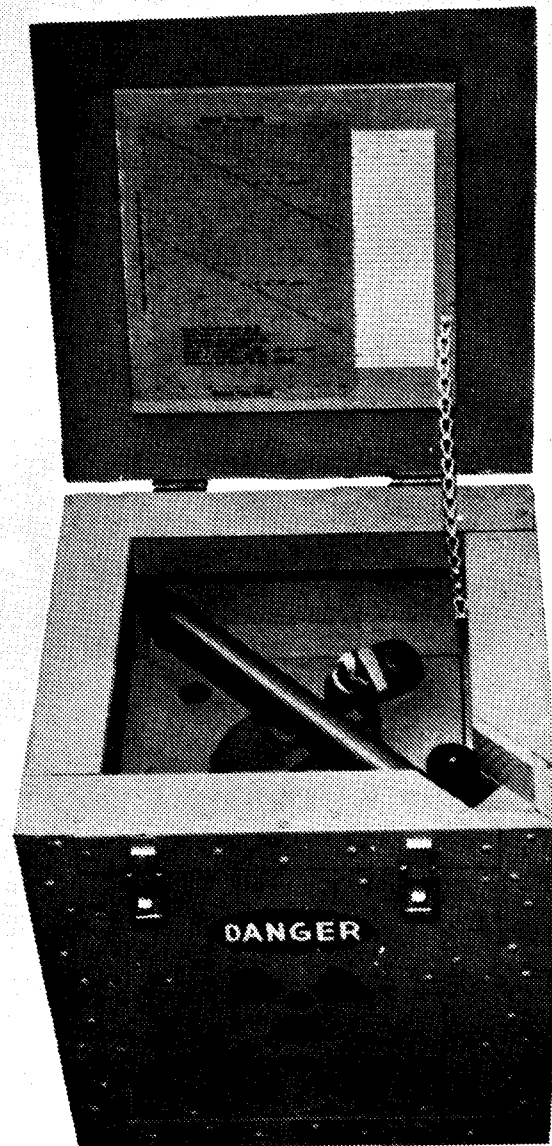


Figure 16-6. Radioactive Source Set, M3A1.

Use: Calibrate radiac instruments and train personnel in radiological safety techniques.

X. RADIAC SET, AN/PDR-27Q

A portable, battery-operated instrument for field use in measuring the dosage rate of beta and/or gamma radiation. Has four ranges: 0-0.5, 0-5, 0-50, and 0-50C millirads per hour.

Reference: TM 11-6665-209-15

Source: LIN Q-19339

NSN 6665-00-017-8903 AN/PDR-27Q

Use: By escort team of chemical-technical escort unit work groups requiring radiation-monitoring protection. CBR survey parties and installations having a radiation protection officer assigned. Medical installations or activities NOA; PLUCON. Installations except medical installations NOA. See SB 700-20 for additional models of the AN/PDR-27.

Y. RADIAC SET, AN/PDR-60

A portable instrument for measuring alpha radiation.

Reference: TM 11-6665-221-15

Source: LIN Q-19750

NSN 6665-00-965-1516

Use: By members of CBR survey teams required to enter radiation areas NOA, or work group requiring radiation monitoring protection CBR atomic team - PLUCON or RADCON.

Z. SCREEN, X-RAY PROTECTIVE, FOLDING, FIELD

A sectionalized, portable screen with carrying case. Gives protection equivalent to 0.6 mm of lead.

Source: LIN S-59496

NSN 6525-00-612-8032

Use: By technicians or operators of X-ray equipment to minimize exposure to harmful radiation during diagnostic procedures.

AA. SCREEN, X-RAY PROTECTIVE MOBILE

A one-piece, curved screen mounted on a metal base equipped with casters. Gives protection equivalent to 1.5 mm of lead.

Source: LIN S-59633

NSN 6525-00-612-8025

Use: By technicians or operators of X-ray equipment to minimize exposure to harmful radiation during diagnostic procedures.

BB. SLEEVE, NUCLEAR, RADIATION PROTECTIVE

A special sleeve made of spun lead-glass fabric, leaded plastic, or leaded rubber to afford protection against radiation.

Source: LIN 87631N

Use: For jobs requiring protection against X-ray and/or beta radiation or ultraviolet rays.

CC. SUIT, RADIATION, ELECTROMAGNETIC

A one-piece, multilayer garment with safety lock closure. Has shielding effectiveness of 50 db over frequency range of 30 MC to 1,000 MC. Arc resistant up to 4,000 volts.

Source: Appendix A

Use: By inspection, maintenance, or operating personnel required to work in high-level radar fields and similar areas where electromagnetic radiation may be present.

DD. SUIT, RADIATION HAZARD, DISPOSABLE (fig. 16-7)



Figure 16-7. Suit, Radiation Hazard, Disposable.

A plastic or paper coverall-type suit for protection against low-level radioactive contamination.

Source: Appendix A

Use: By radiochemical laboratory technicians and members of decontamination and/or civil defense teams and activities requiring protection against low-level radioactive contamination is required.

Limitation: Generally not durable enough for use in severe decontamination procedures.

16-3 CLOTHING AND EQUIPMENT FOR RADIATION HAZARDS

The items listed below are applicable to radiant and light energy and are described in other chapters of this pamphlet. Refer to "Subject Item Index" or chapter indicated.

NOTE: Inasmuch as the entire field of radiant and light energy is highly specialized, technical, and complex and requires the use of specific types of clothing and equipment for safety purposes, there is very little application for items other than those given above, except in unusual situations.

As stipulated in connection with the prior list, none of these items should be used without the knowledge and approval of competent personnel.

Apron Welder's: Asbestos, Leg Length - Chapter 14

LIN 80272N

Cap, Maintenance Personnel, Male and Female Leather - Chapter 4

LIN 81153N

Cap, Protective, Maintenance Personnel: Powder Shop, White, Drill - Chapter 4

LIN 81160N

Coveralls, Men's: White, Cotton Sateen, Carded, 8.8 oz - Chapter 5

LIN F-32535

Coveralls, Safety Industrial, Fire, Oil, Water, and Chemical Resistant - Chapter 5 and 16

LIN 81475N

Drawers, Men's: Cotton, Thigh Length, White, Elastic Waist Band - Chapter 5

LIN G-48939

Filter Particulate - Chapter 10

LIN C-92981

Gloves, Arm Length Synthetic Rubber - Chapter 10

Appendix A

Glovebox, Controlled Atmosphere - Chapter 10

Appendix A

Leggings, Protective, Industrial, Knee or Hip Length - Chapter 5

LIN 84651N and 84656N

Overalls, Safety: Oil and Acid Protective, Bib Type, Infrared Protective - Chapter 5

LIN 85856N

Shirt, Safety, Oil and Acid Protective: Fire and Water Resistant - Chapter 5

LIN 87205N

Shoes, Nonsparking: Traction Tread Sole and Heel, Mildew Resistant - Chapter 6

LIN T-08472

Sleeve, Cape and Bib: Welder's Flame Proof

LIN 87621N

Socks, Men's: Cotton-Nylon, Black Shade 94, Stretch - Chapter 6

LIN T-92171

Sweatband: Adjustable - Chapter 14

LIN 87776N

Trousers, Safety: Oil and Acid Protective, Fire and Water Resistant - Chapter 5

LIN 88265N

Undershirt, Man's: Cotton - Chapter 5

LIN X-86702

16-4 HAZARDS ASSOCIATED WITH RADIANT ENERGY AND LIGHT ENERGY

In general, occupations in the field of radiant energy may be considered as falling into three basic categories:

1. Ionizing radiation in which the exposure is primarily external from particles or rays, such as would be encountered when dealing with a sealed source or some form of radiation-producing machinery.

2. Ionizing radiation in which the primary problem is contamination resulting from direct bodily contact (either external or internal) with radioactive materials, such as might occur in chemical separations operations or decontamination procedures.

3. Nonionizing radiation of the type generated by infrared heat, high-intensity light sources, or radar units.

Under ordinary conditions, the best protection against external sources of radiation lies in the judicious use of time, distance, and shielding as stated above, supplemented as necessary by selected items of protective clothing to minimize the effect of stray emissions or "Scatter", or to afford additional protection under special circumstances. Contamination-type exposures, on the other hand, call for the use of protective clothing as well as respiratory protection. Good practice dictates the use of personal monitoring equipment in either case.

In the case of nonionizing radiation, the primary area of concern is the eyes (laser beams, welding operations, etc.), but supplementary body protection is also required in many instances (heat, sparks, stray emissions, etc.).

Frequently (and especially under unusual or emergency conditions) personnel working primarily with external sources of radiation can be exposed directly to radioactive contamination.

When such situations arise or are anticipated, proper protective equipment should be obtained, based on the recommendations of a health physicist or other knowledgeable personnel.

16-5 SELECTED PORTIONS OSHA STANDARDS — CONSTRUCTION SAFETY AND HEALTH REGULATIONS — SUBPART E — PERSONAL PROTECTIVE AND LIFESAVING EQUIPMENT — LASER PROTECTION

“(2) *Laser protection.* (i) Employees whose occupation or assignment requires exposure to laser beams shall be furnished suitable laser safety goggles which will protect for the specific wavelength of the laser and be of optical density (O.D.) adequate for the energy involved. Table E-3 lists the maximum power or energy density for which adequate protection is afforded by glasses of optical densities from 5 through 8. (See also page 17, TB MED 279, dated 18 Sep 74).

TABLE E-3—SELECTING LASER SAFETY GLASS

INTENSITY	ATTENUATION	
CW maximum power density (watts/cm ²)	Optical density (O.D.)	Attenuation factor
10 ⁻²	5	10 ⁵
10 ⁻¹	6	10 ⁶
1.0	7	10 ⁷
10.0	8	10 ⁸

Output levels falling between lines in this table shall require the higher optical density.

“(ii) All protective goggles shall bear a label identifying the following data:

“(a) The laser wavelengths for which use is intended;

“(b) The optical density of those wavelengths;

“(c) The visible light transmission.”

16-6 OSHA RADIATION WARNING SIGNS (Section 1910.144 - Safety Color Code for Marking Physical Hazards)

“(3) *Radiation warning signs.* (i) Standard color of the background shall be yellow; the panel, reddish purple with yellow letters; the

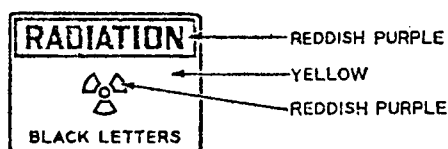


Figure J-2.
Radiation Warning Sign

symbol, reddish purple; any letters used against the yellow background shall be black. The colors shall be those of opaque glossy samples as specified in table 1 of American National Standard, Z53.1-1971.

“(ii) The standard symbol shall be as in figure J-3. Method of dimensioning, design, and orientation of the standard symbol (one blade pointed downward and centered on the vertical axis) shall be executed as illustrated. The symbol shall be prominently displayed, and of a size consistent with the size of the equipment or material or area to which it is attached.

“(iii) Format shall be as in figure J-2.”

16-7 OSHA ELECTROMAGNETIC STANDARDS AND WARNING SYMBOL (Section 1910.97 - Nonionizing Radiation)

“(a) *Electromagnetic radiation—(1) Definitions applicable to this paragraph.* (i) The term “electromagnetic radiation” is restricted to that portion of the spectrum commonly defined as

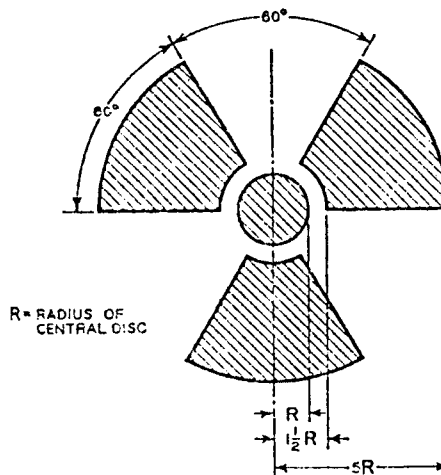


Figure J-3.
Standard Radiation Symbol

the radio frequency region, which for the purpose of this specification shall include the microwave frequency region.

“(ii) *Partial body irradiation*. Pertains to the case in which part of the body is exposed to the incident electromagnetic energy.

“(iii) *Radiation protection guide*. Radiation level which should not be exceeded without careful consideration of the reasons for doing so.

“(iv) The word “symbol” as used in this specification refers to the overall design, shape, and coloring of the rf radiation sign shown in figure G-11.

“(v) *Whole body irradiation*. Pertains to the case in which the entire body is exposed to the incident electromagnetic energy or in which the cross section of the body is smaller than the cross section of the incident radiation beam.

“(2) *Radiation protection guide*. (i) For normal environmental conditions and for incident electromagnetic energy of frequencies from 10 MHz to 100 GHz, the radiation protection guide is 10 mW/cm.² (milliwatt per square centimeter) as averaged over any possible 0.1-hour period. This means the following:

Power density: 10 mW./cm.² for periods of 0.1-hour or more.

Energy density: 1 mW.-hr./cm.² (milliwatt-hour per square centimeter) during any 0.1-hour period.

This guide applies whether the radiation is continuous or intermittent.

“(ii) These formulated recommendations pertain to both whole body irradiation and partial body irradiation. Partial body irradiation must be included since it has been shown that some parts of the human body (e.g., eyes, testicles) may be harmed if exposed to incident radiation levels significantly in excess of the recommended levels.

“(3) *Warning symbol*. (i) The warning symbol for radio frequency radiation hazards shall consist of a red isosceles triangle above an

inverted black isosceles triangle, separated and outlined by an aluminum color border. The words ‘Warning—Radio-Frequency Radiation Hazard’ shall appear in the upper triangle. See figure G-11.

“(ii) American National Standard Safety Color Code for Marking Physical Hazards and the Identification of Certain Equipment, Z53.1—1971, shall be used for color specification. All lettering and the border shall be of aluminum color.

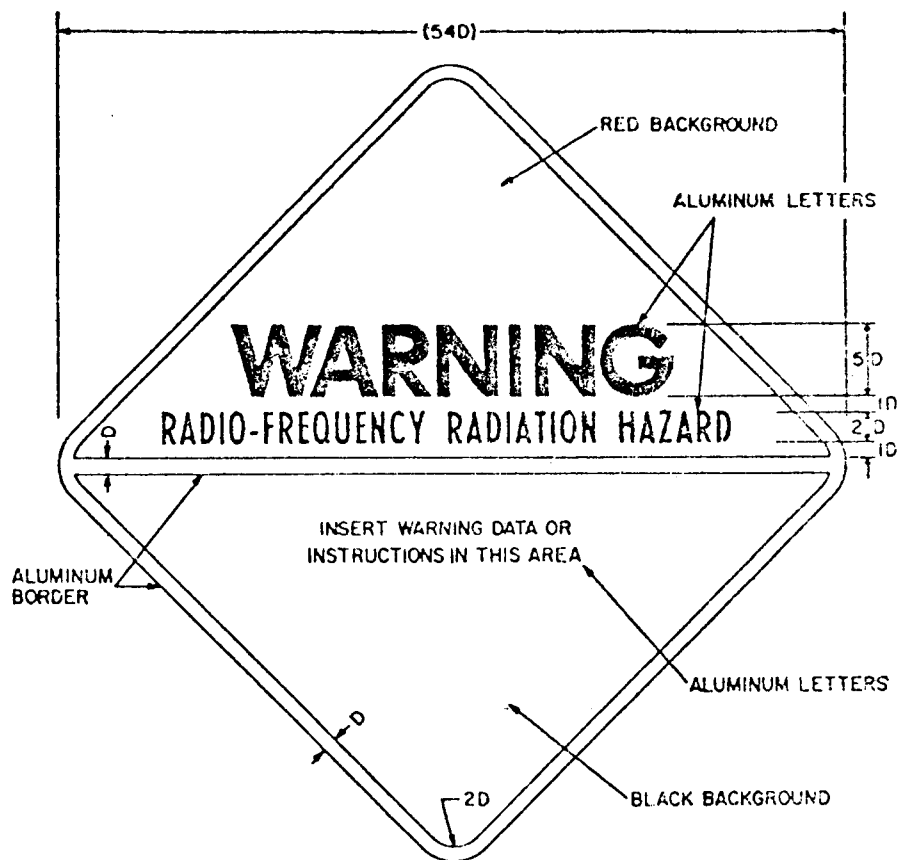
“(iii) The inclusion and choice of warning information or precautionary instructions is at the discretion of the user. If such information is included it shall appear in the lower triangle of the warning symbol.

“(4) *Scope*. This section applies to all radiations originating from radio stations, radar equipment, and other possible sources of electromagnetic radiation such as used for communication, radio navigation, and industrial and scientific purposes. This section does not apply to the deliberate exposure of patients by, or under the direction of, practitioners of the healing arts.”

16-8 LASER RADIATION WARNING SYMBOL



Figure 16-8. Laser Radiation Warning Symbol



1. Place handling and mounting instructions on reverse side.
2. D = Scaling unit.
3. Lettering: Ratio of letter height to thickness of letter lines.
 - Upper triangle : 5 to 1 Large
 - 6 to 1 Medium
 - Lower triangle 4 to 1 Small
 - 6 to 1 Medium
4. Symbol is square, triangles are right-angle isosceles.

Figure G-11.
Radio-Frequency Radiation Hazard Warning Symbol

CHAPTER 17. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR HANDLING FUEL

17-1 INTRODUCTION

Fuels, which are a boon to man, can also wreak havoc and destruction if improperly or carelessly handled. The explosive character of fuels is readily recognized, yet the explosions and fires which have occurred attest to the fact that industry and government do not always adhere to the rules of safety in handling and storing fuels.

What can be done to prevent possible accidents in handling fuels?

To prevent a recurrence of these destructive accidents, definite safe practices must be observed. Smoking, open lights, and other possible sources of ignition must be absolutely prohibited in areas where fuels are handled or stored. All equipment must be electrically grounded, and workmen in the area should wear conductive clothing and shoes to prevent a buildup of static electricity. Only nonsparking tools should be allowed in fuel storage or dispensing areas.

Where tank repair or tank cleaning is necessary, the tank must be certified as gas free, and gas tests must be run continuously while cutting or welding operations are proceeding.

In addition to the explosive character of fuels, the physiological effects of the worker's exposure must be kept in mind and definite safe practices enforced.

Practically all fuels have a deleterious effect upon the skin. This danger is increased in instances where the skin is cut or broken. To prevent this exposure, proper clothing, boots, and gloves must be worn. Solvents and volatile liquids have a tendency to remove the natural oils from the skin and are a principal cause of dermatitis. Certain of these substances can also be absorbed through the skin and cause damage to internal organs.

The accidental ingestion of fuels and solvents from contaminated clothing and skin should be prevented. Pertinent work practices to include protective clothing, personal hygiene, and special precautions to avoid transmittal of contaminants at eating facilities should be considered.

See Chapter 10, Section 10-3.1 for enclosed suit stress warning.

For petroleum-handling equipment operation, refer to TM 10-1101.

17-2 SELECTED PORTIONS OF OSHA STANDARDS, PART 1926 – SAFETY AND HEALTH REGULATIONS AND CONSTRUCTION – SUBPART F – FIRE PROTECTION AND PREVEN- TION

“§ 1926.152 Flammable and combustible liquids.

“(a) *General requirements.* (1) Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids. Approved metal safety cans shall be used for the handling and use of flammable liquids in quantities greater than one gallon, except that this shall not apply to those flammable liquid materials which are highly viscid (extremely hard to pour), which may be used and handled in original shipping containers. For quantities of one gallon or less, only the original container or approved metal safety cans shall be used for storage, use, and handling of flammable liquids.

“(2) Flammable or combustible liquids shall not be stored in areas used for exits, stairways, or normally used for the safe passage of people.

“(e) *Dispensing liquids.* (1) Areas in which flammable or combustible liquids are transferred at one time, in quantities greater than 5 gallons from one tank or container to another tank or container, shall be separated from other operations by 25-foot distance or by construction having a fire resistance of at least 1 hour. Drainage or other means shall be provided to control spills. Adequate natural or mechanical ventilation shall be provided to maintain the concentration of flammable vapor at or below 10 percent of the lower flammable limit.

“(2) Transfer of flammable liquids from one container to another shall be done only when containers are electrically interconnected (bonded).

“(3) Flammable or combustible liquids shall be drawn from or transferred into vessels, containers, or tanks within a building or outside

only through a closed piping system, from safety cans, by means of a device drawing through the top, or from a container, or portable tanks, by gravity or pump, through an approved self-closing valve. Transferring by means of air pressure on the container or portable tanks is prohibited.

“(4) The dispensing units shall be protected against collision damage.

“(5) Dispensing devices and nozzles for flammable liquids shall be of an approved type.

“(f) *Handling liquids at point of final use.* (1) Flammable liquids shall be kept in closed containers when not actually in use.

“(2) Leakage or spillage of flammable or combustible liquids shall be disposed of promptly and safely.

“(3) Flammable liquids may be used only where there are no open flames or other sources of ignition within 50 feet of the operation, unless conditions warrant greater clearance.

“(g) *Service and refueling areas.*

(1) Flammable or combustible liquids shall be stored in approved closed containers, in tanks located underground, or in aboveground portable tanks.

“(2) The tank trucks shall comply with the requirements covered in the Standard for Tank Vehicles for Flammable and Combustible Liquids, NFPA No. 385-1966.

“(3) The dispensing hose shall be an approved type.

“(4) The dispensing nozzle shall be an approved automatic-closing type without a latch-open device.

“(5) Underground tanks shall not be abandoned.

“(6) Clearly identified and easily accessible switch(es) shall be provided at a location remote from dispensing devices to shut off the power to all dispensing devices in the event of an emergency.

“(7) (i) Heating equipment of approved type may be installed in the lubrication or service area where there is no dispensing or transferring of flammable liquids, provided the bottom of the heating unit is at least 18 inches above the floor and is protected from physical damage.

“(ii) Heating equipment installed in lubrication or service areas, where flammable liquids are dispensed, shall be of an approved

type for garages, and shall be installed at least 8 feet above the floor.

“(8) There shall be no smoking or open flames in the areas used for fueling, servicing fuel systems for internal combustion engines, receiving or dispensing of flammable or combustible liquids.

“(9) Conspicuous and legible signs prohibiting smoking shall be posted.

“(10) The motors of all equipment being fueled shall be shut off during the fueling operation.

“(11) Each service or fueling area shall be provided with at least one fire extinguisher having a rating of not less than 20-B:C located so that an extinguisher will be within 75 feet of each pump, dispenser, underground fill pipe opening, and lubrication or service area.”

17-3 SPECIFIC ITEMS FOR FUELS

A. CAN, GASOLINE

A 5-gallon metal container for handling flammable liquids.

Source: LIN C-90022

NSN 7240-00-222-3088

Use: By personnel required to handle small quantities of fuels.

NOTE: See section 14-4 for color coding of containers.

B. MOVER, LAMB, AIR, 6-IN. MODEL, MSA OR EQUAL (fig. 17-1)

An aluminum horn with 6-in.-diameter throat integrally mounted on a cast aluminum-magnesium bell with threaded air or steam inlet. Approximately 4 ft long overall. Weighs 25 lb. No moving parts.

Source: LIN 45979N

Use: By personnel performing process work in hazardous area where ventilation is required, such as fuel tank or railroad tank car. May be used either as a blower or an exhauster.

Limitation: Requires source of compressed air or steam for operation.

C. SAFETY CAN

Source: NSN 7240-00-178-8285

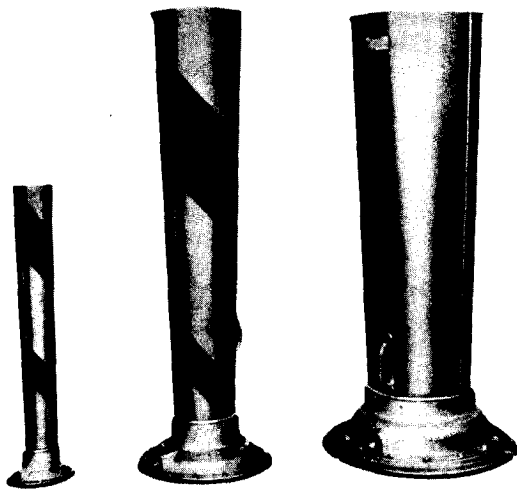


Figure 17-1. Mover, Lamb, Air,
6-inch Model, MSA or Equal.

Use: Per shop set, field maintenance, automotive.

Reference: CTA 50-970

NOTE: See section 14-4 for color coding of containers.

D. SAFETY CAN, STEEL, 5 GAL CAPACITY

Source: NSN 7240-00-222-3086

Use: Per kit bag, car, ILO, can, gasoline, military.

Reference: CTA 50-970

NOTE: See section 14-4 for color coding of containers.

E. SAFETY EQUIPMENT SET: GASOLINE TANK CLEANING

Source: LIN S-29227

NSN 4240-00-510-0204

Use: Provides essential equipment for physical and respiratory protection for personnel engaged in cleaning leaded gasoline-storage tanks.

F. SHOWER UNIT, SAFETY, ROCKET PROPELLANT NEUTRALIZER

A 100-gallon capacity tank with heating provisions and two air cylinders for ejecting water.

Source: LIN T-41545

NSN 4230-00-601-7468

Mil Spec S-50001

Use: By personnel working in guided-missile-handling activities or in operations where there is danger of splash from acids or other corrosive liquids, and/or where toxic materials are present.

G. TOOLS, NONSPARKING

Spark-proof tools made from beryllium copper alloy to reduce ignition hazard.

Source: Appendix A

Use: To be used in areas where potentially explosive dusts, vapors, or gases are stored or handled.

Limitation: Should be inspected after use to be sure that the beryllium copper alloy has not become impregnated with particles capable of producing sparks.

17-4 CLOTHING AND EQUIPMENT FOR FUEL HANDLERS

The items listed below are for individuals working with fuels and are described in more detail in other chapters of this pamphlet. Refer to appendix B, "Safety Item Index," or to chapter indicated.

Apron, Impermeable: Duck Rubber, Coated Black — Chapter 5

LIN A-86590

Apron, Welders: Asbestos, Leg Length — Chapter 14

LIN 80272N

Boots, Fireman's — Chapter 14

Boots, Safety: Nonmarking, Nonconductive, 8 Inch — Chapter 6

LIN 80603N

Cap, Protective, Maintenance Personnel: Adjustable, Flame Proof Cotton Twill — Chapter 4

LIN 81143N

Cap, Protective, Maintenance Personnel, Male and Female, Leather — Chapter 4

LIN 81153N

Cap, Protective, Maintenance Personnel: Painter's, Cotton — Chapter 4

LIN 81157N

Can, Flammable Waste — Chapter 20

Chaps, Leather — Chapter 5

Coat, Fireman's: Asbestos Aluminum — Chapter 14

LIN E-43483

Coat, Fireman's: Cotton Sateen, OG107,
FR/WR — Chapter 14
LIN E-43527

Coveralls, Explosive Handler's — Chapter 14
LIN F-31850

Coveralls, Explosive Handler's: White
Powder Jean, Closed Waist, Cover Shoe —
Chapter 14
LIN 81456N

Coveralls, Safety Industrial: Cotton Sateen,
White — Chapter 5
LIN F-33046

Coveralls, Men's: White Cotton Sateen,
Carded, 8.8 oz — Chapter 5
LIN F-32535

Coveralls, Safety, Industrial, Fire, Oil, Water,
and Chemical Resistant
LIN 81475N

Cream, Barrier — Chapter 20

Drawers, Men's Cotton — Chapter 5
LIN G-48939

Face Shield, Industrial, Hinged Window —
Chapter 4
LIN H-30636

Glasses, Safety — Chapter 4

Gloves, Cloth: Leather Palm Gauntlet —
Chapter 7
LIN J-65187

Gloves, Fireman's: Asbestos Aluminum-
Coated, Gauntlet Cuff — Chapter 14
LIN J-67037

Gloves, Leather: Strap Closure, Cream,
M1950 — Chapter 4
LIN J-68064

Gloves, Leather: Work Type, Goat Skin,
Snug Fitting — Chapter 4
LIN 82905N

Gloves: Plastic Coated, Impermeable,
Gauntlet Cuff — Chapter 4
LIN 82910N

Gloves, Rubber: Acid and Alkali Resistant,
Black, Type I — Chapter 4
LIN J-69160

Gloves, Rubber: Aromatic Fuel Resistant,
Black, Type II — Chapter 4
LIN J-69434

Gloves, Rubber, Gauntlet — Chapter 4

Gloves, Rubber: Organic Solvent Resistant,
Type III — Chapter 4
LIN J-69845

Goggles, Chemical Splash — Chapter 11

Goggles, Safety — Chapter 4

Hood, Fireman's: Asbestos Aluminum-
Coated, Fire Resistant — Chapter 14

Jacket, Safety, Oil and Acid Protective —
Chapter 5
LIN 84125N

Leggings, Protective Industrial, Knee or Hip
Length — Chapter 5
LIN 84651N
LIN 84656N

Overalls, Safety: Oil and Acid Protective,
Bib Type, Infrared Protective — Chapter 5
LIN 85856N

Overshoes, Men's: Rubber, High Cleated, 5
Buckle — Chapter 6
LIN N-39848

Parka, Wet Weather: With Fireproof Ex-
terior Fabric and Removable Liner —
Chapter 5
LIN 85927N

Sandal, Strap On — Chapter 6
LIN 87112N

Safety Equipment Set: Gasoline Tank
Cleaning — Chapter 17
LIN S-29227

Shirt, Safety, Oil and Acid Protective: Fire
and Water Resistant — Chapter 5
LIN 87205N

Shoes, Nonsparking: Traction Tread Sole
and Heel, Mildew Resistant — Chapter 6
LIN T-08472

Shoe, Safety: Clog Conductive — Chapter 6
LIN 87231N

Shoe, Safety: Oil and Acid Protective Non-
sparking Safety Toe
LIN 87248 (Men)
LIN 87250N (Women)

Shoe: Safety Oil and Acid Protective
LIN 87244N

Sleeve, Cape and Bib Welder's: Flameproof
— Chapter 5
LIN 87621N

Socks, Men's: Cotton Nylon, Black Shade
94, Stretch
LIN T-92171

Spat, Protective — Chapter 6

Suit, Utility — Chapter 5

Trousers, Safety: Oil and Acid Protective,
Fire and Water Resistant — Chapter 5
LIN 88265N

Undershirt, Man's: Cotton — Chapter 5
LIN X-86702

17-5 HAZARDS ASSOCIATED WITH FUEL HANDLING

If, at times, additional hazards may be encountered, reference should be made to the specific section pertaining to that hazard for the selection of appropriate supplementary protective items. For example, if the additional hazard happens to be "fire or explosion," refer to chapter 14, "Special Safety Protective Clothing and Equipment for Fire, Heat, and Explosion."

17-6 ROCKET FUEL HANDLER (fig. 17-2)

Ensembles are provided for individuals whose work assignments require protection from guided missile fuels and oxidizers. This protective clothing is not stored or issued as an ensemble; therefore, all components should be requisitioned separately. The limited protection ensemble shall be issued in lieu of the full protection ensemble when limited protection only is required.



Figure 17-2. Rocket Fuel Handler.

Reference: TM10-279, Protective Clothing for Missile Fuel Handlers

A. ENSEMBLE, ROCKET FUEL HANDLER'S FULL PROTECTION

BOOTS, KNEE: MEN'S, RUBBER, BLACK, CLEATED SOLE AND HEEL

Source: LIN C-08530
NSN 8430-00-262-8252 through 8261
NSN 8430-00-262-8278
(various sizes)

BREATHING APPARATUS, OXYGEN GENERATING

Source: LIN C-19640
NSN 4240-00-678-5263

COVERALLS, ROCKET FUEL HANDLER'S: FULL PROTECTION, BUTYL RUBBER

Source: LIN F-32672
NSN 8415-00-725-3627 through 3631

GLOVES, ROCKET FUEL HANDLER'S: COTTON KNIT, POLYVINYL, OR VINYL COATED

Source: LIN J-68612
NSN 8415-00-753-6212 through 6215

HOOD, ROCKET FUEL HANDLER'S: FULL PROTECTION, BUTYL RUBBER

Source: LIN K-45672
NSN 8415-00-753-3050

B. ENSEMBLE, ROCKET FUEL HANDLER'S LIMITED PROTECTION

BOOTS, KNEE: MEN'S, RUBBER, BLACK, CLEATED SOLE AND HEEL

NOTE: Used with both full and limited protection ensembles.

COVERALLS, ROCKET FUEL HANDLER'S: LIMITED PROTECTION, BUTYL RUBBER

Source: LIN F-32809
NSN 8415-00-753-6208 and 6209

GLOVES, ROCKET FUEL HANDLER'S: COTTON KNIT, POLYVINYL, OR VINYL COATED

NOTE: Used with both full and limited protection ensembles

HOOD, ROCKET FUEL HANDLER'S: LIMITED PROTECTION, BUTYL RUBBER

Source: LIN K-45809
NSN 8415-00-753-6211

CHAPTER 18. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR TRANSPORTATION

18-1 INTRODUCTION

The Occupational Safety & Health Act standards have no sections dealing with the *general* subject of transportation by highway trucks. However, there are some requirements for trucks used for specialized purposes.

Transportation of Explosives & Blasting Agents (1910.109 d)—1. General Provisions (This covers: prohibition of smoking, flames, and firearms in or near such vehicles; safe driving; prohibition against using passenger vehicle; notification of each governmental jurisdiction; separate carrying of blasting caps.)

2. Transportation Vehicles—(This covers: strength of vehicle, covered load, tight floors, nonsparking exposed parts, height of loading, exterior markings; two well-maintained fire extinguishers rated at least 10-BC; inspection of extinguishers, electrical wiring, oil-free underside, fuel tank and lines, brakes, lights, horn, windshield wiper, and steering, tires and general condition.)

3. Operation of Vehicles—(This covers: driver fitness; prohibition against parking; continuous attendance unless in secured area; prohibited items in same load; avoidance of congested areas; authorized deliveries.)

Pulpwood Logging (1910.266 e.9)—Truck drivers must be instructed to stop, dismount, check, and tighten loose load binders, either just before or immediately after leaving a private road to enter a public road.

18-2 CONSTRUCTION SAFETY ACT TRANSPORTATION SAFETY REQUIREMENTS

The standards for construction operations, incorporated into OSHA, include a Subpart O—Motor Vehicles, Mechanized Equipment & Marine Operations.

Equipment General Requirements (1926.600)—1. All equipment left unattended at night by a highway in use or by continuing construction work must have appropriate lights or reflectors, or barricades equipped with lights or reflectors.

2. A safety tire rack, cage, or equivalent must be provided and used when inflating, mounting, or dismounting tires installed on split rims, or rims with locking rings or similar devices.

3. (i. This covers blocking of suspended loads, blocking or lowering during nonuse, and neutralization of controls.) ii. Whenever equipment is parked, parking brake must be set. On inclines, the wheels must be chocked also.

4. (Battery charging must conform to Subpart K of the Construction Safety Act.)

5. All cab glass must be safety glass or equivalent, with no visible distortion to affect operations.

6. Equipment near power lines must conform to 1926.550 a.15. (See standards summaries for Hoist, Crane & Elevator Products in this Directory.)

Motor Vehicles (1926.601)—a. This section applies to vehicles operating in an off-highway jobsite, not open to public traffic, but does not include earthmoving equipment (see 1926.602 below).

b. General Requirements: 1. All vehicles must have a service brake system, emergency brakes, and parking brakes. They may use common components and must be kept operable.

2. When visibility requires it, vehicles must have at least two headlights and two taillights, all operable. Vehicles must also have working brake lights.

3. All vehicles must have an adequate, operable warning horn.

4. Any motor vehicle that has an obstructed view to the rear must have a reverse signal alarm audible above the surrounding noise level, or else have an observer to signal that backing operations are safe.

5. Vehicle cabs must have unbroken and uncracked windshields with powered wipers, and also defogging and defrosting devices when required.

6. All haulage vehicles loaded by other

equipment must have a cab shield and/or canopy to protect the operator.

7. Tools and equipment must be secured when in the same compartment with employees.

8. Vehicles for carrying employees must have enough firmly secured seats for the passengers.

9. Seat belts and anchorages meeting DOT requirements must be installed on all motor vehicles.

10. Dump trucks must have a positive support that can be locked in position to prevent lowering during repairs or inspection.

11. Operating levers for hoisting or dumping must have a latch or other device to prevent accidental starting.

12. Trip handles for dump truck tailgates must be located so operator will be in the clear during dumping.

13. All rubber-tired vehicles made after May 1, 1972, must have fenders, all others must have fenders by May 1, 1973. Mud flaps may be substituted for fenders if necessary.

14. All vehicles to be used must be checked before each shift for safe operating conditions of: service brakes (including trailer connections), hand brakes, emergency brakes, tires, horn, steering, coupling devices, seat belts, operating controls, and safety devices; also where needed, lights, reflectors, windshield wipers, defrosters, fire extinguishers, etc.

Construction material handling equipment (1926.602)—a. Earthmoving equipment—General: 1. This section applies to scrapers, loaders, crawler or wheel tractors, bulldozers, off-highway trucks, graders, agricultural and industrial tractors, etc.

2. **Seat Belts:** Earthmoving equipment must have seat belts that meet Society of Automotive Engineers requirements, J386-1969, Seat Belts for Construction Equipment. Seat belts for agricultural and light industrial tractors must meet SAE requirements, J333a-1970, Protection for Wheeled Agricultural and Light Industrial Tractors. Seat belts are not required on equipment designed only for standup operation, nor on equipment that does not have rollover protective structure or adequate canopy.

3.-8. (These paragraphs cover brakes, fenders, rollover protective structures for earth-

moving equipment and off-highway trucks, and the effective dates.)

9. **Audible Alarms:** i. All bidirectional machines must have an operating horn, distinguishable from the surrounding noise, to be used as needed in either direction. ii. Earthmoving or compacting equipment with an obstructed view to the rear must have either a reverse signal alarm or an employee's signal that it is safe to back up.

10. **Scissor Points** on front-end loaders must be guarded if hazardous to the operator.

b. Excavating and other equipment—1. Tractors, even with backhoe, breakers and other attachments, must have seat belts for the operators. (This paragraph also covers attachment nomenclature and the need for conforming to the Power Crane & Shovel Association's Standards 1, 2, & 3.)

Subpart U of the Construction Safety Act is concerned with Blasting and the Use of Explosives. The section on the surface transportation of explosives (1926.902) is generally similar to the corresponding standards in OSHA (see above). However, the Construction standards call for one fire extinguisher of at least a 10-ABC rating. They also prohibit taking vehicles carrying explosives, blasting agents or blasting supplies inside a garage or shop for repairs or servicing.

Subpart W gives requirements for rollover and overhead protection for rubber-tires scrapers, front-end loaders and dozers; wheel-type tractors, crawler tractors and loaders, and motor graders.

Unloading of trucks (1910.261 m.5)—i. Where steel bands or wires are used in boxcars or trucks, all loaders and helpers must wear eye protection in accordance with ANSI standards.

ii. The construction and use of dock plates must conform to ANSI B56.1-1969.

18-3 SPECIFIC ITEMS FOR TRANSPORTATION

A. ALARM, TRUCK BACK UP (fig. 18-1 Electrical; fig. 18-2 Mechanical)

This device automatically sounds an alarm when the vehicle moves in reverse to warn personnel in the immediate area. Mechanical and

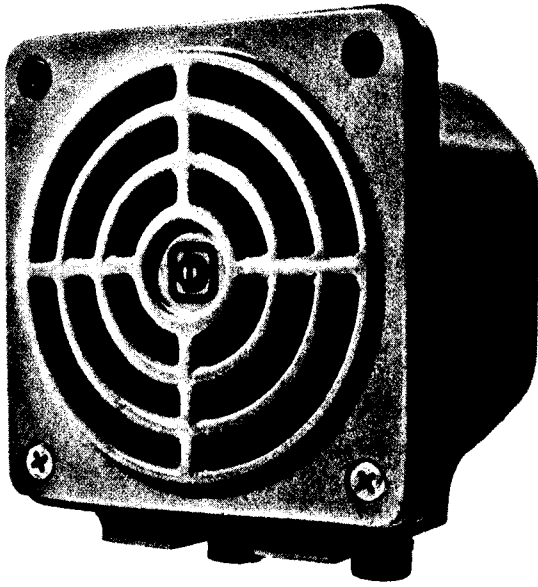


Figure 18-1. Electrical.

electric types are available. OSHA requires reverse signal alarms on construction vehicles and electric utility trucks if the driver's rear view is obstructed (or else an observer must be present for safe backing operations).

Source: Appendix A

Use: As a safety warning device on vehicles required to back up in high-noise-level areas.

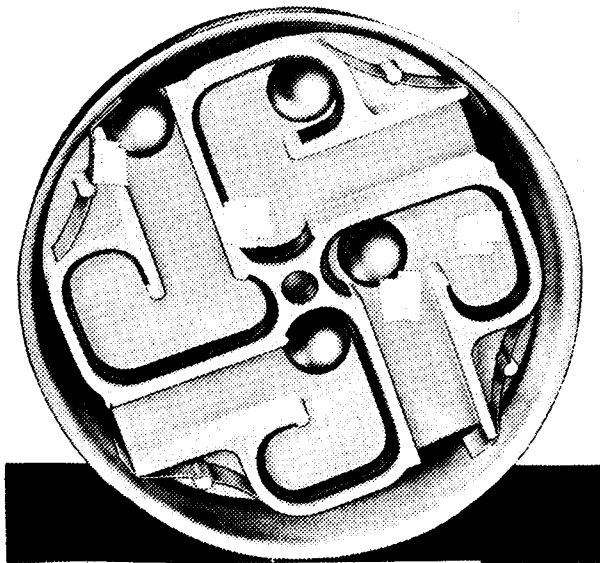


Figure 18-2. Mechanical.

B. BARRICADE

A portable warning barrier consisting of two sets of legs and a flat steel panel with 6-inch alternating black or yellow diagonal stripes. Various sizes.

Source: Appendix A

Use: By maintenance workers, construction workers, road crews, policemen, etc., to alert motorists and pedestrians to road repair operations, construction hazards, rock falls, excavations, and other similar hazards. May be used in conjunction with steady or flashing lights in dark areas or at night.

C. CONE, TRAFFIC

A rubber cone with base, plain or striped, 16 to 28 inches high, red, orange or yellow color.

Source: Appendix A

Use: By road repair crews and police to control traffic.

D. DETONATOR

A battery-activated device for measuring reaction time of vehicle operators, 12 or 24 volt DC.

Source: Appendix A

Use: By safety officer or driver instructor to demonstrate or obtain reaction distance travel of a motor vehicle operator at a specified vehicle speed.

Limitation: Requires 12 or 24 volt DC energy source.

E. FLAG, WARNING

A hand-type signal flag, approximately 18 inches square, available in various colors, plain or reflectorized.

Source: Appendix A

Use: By trainmen, construction workers, road repair crews, and others as a warning device.

F. FLASHING LIGHTS AND/OR FLARES

A portable battery-operated flashing light and/or oil flares and fuses. Trucks carrying flammable liquids or gases should use electric lanterns.

Source: Appendix A

Use: To prevent accidents by warning motorists of road obstructions.

Limitation: Do not use open lights or flares around vehicles carrying flammable liquids or gases.

G. FOG LIGHT

An amber light to aid vision in fog.

Source: Appendix A

Use: On trucks, buses, or passenger cars to give driver a clearer view of road when driving in fog.

H. LIGHT, FLASHING, EMERGENCY

A portable, battery-operated, red flashing light, which can be used as a temporary traffic signal.

Source: Appendix A

Use: For protection of men making emergency street repairs or as a traffic control warning device.

Limitation: Not for use in areas where flammable vapors may be present. U.L.-approved dry cell lanterns must be used in such hazardous areas.

I. LIGHT WARNING, VEHICLE 12 VOLT. SEVERAL TYPES AVAILABLE (fig. 18-3)

Source: NSN 6220-00-284-0940

Use: By MP vehicle, ambulance, fire truck, or other type vehicles used as emergency conveyance.

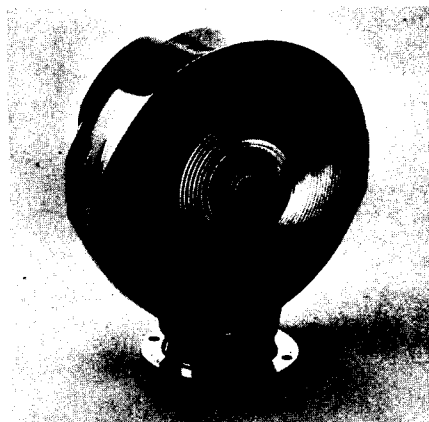


Figure 18-3(A). Lollipop Lamp.



Figure 18-3(B). Strobe.



Figure 18-3(C). Revolving Red Beacon.



Figure 18-3(D). Rotary Beacon.

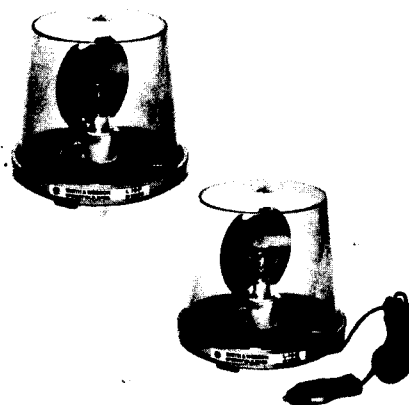


Figure 18-3(E). Revolving Lamp.

J. MIRROR, REAR VIEW, WIDE VIEW, GLARE REDUCING

A curved mirror or one with clip-on wing to increase the area of rear vision and at same time be capable of reducing glare from lights of following vehicles.

Source: Appendix A

Use: On trucks and cars to provide wide angle of rear vision and protection from glare.

K. REFLECTOR, REFLEX, TRUCK AND BUS

Reflex reflectors are made of heavy glass beads or plastic lenses, which catch and reflect light rays coming from all directions.

Source: Appendix A

Use: By trucks, buses, or trailers to warn of their presence and prevent possible collision. Amber reflectors are placed on sides near lower front corner, and red reflectors on lower rear and lower right and left sides of the vehicle.

L. STEERING AID, INDUSTRIAL TRUCK

A self-contained combination steering wheel and automatic clutching device for counteracting steering "kick-back" on industrial trucks.

Source: Appendix A

Use: For mounting on powered industrial trucks operating outdoors or on uneven floors to eliminate accidents caused by sudden twisting of the steering wheel if the truck wheels strike a depression or obstacle.

M. VEHICLE FLAGS

Red flags mounted on standards for use on trucks and buses as warning to motorists of a stalled or parked vehicle.

Source: NSN 8345-00-260-2724

Use: To warn motorists of danger presented by stalled or parked truck or bus. Unmounted flags should be attached to loads which extend over the front or rear of vehicle. See CTA 50-970 for other vehicle flags.

18-4 GENERAL PROTECTIVE CLOTHING AND EQUIPMENT FOR TRANSPORTATION ACTIVITIES

The items listed below are applicable to

transportation duties and are described in other chapters of this pamphlet. Refer to "Subject Item Index."

1. Alarm, Truck, Back-Up.
2. Anti-Fogging Kit.
3. Cap, Protective Maintenance.
4. Ear Muffs or Ear Plugs.
5. Glasses, Sun, Spectacle Type.
6. Gloves, Cloth, Leather Palm Gauntlet.
7. Gloves, Cloth, Men's, Natural.
8. Gloves, Leather, Cream.
9. Goggles, Dust.
10. Light, Flashing, Emergency.
11. Shoe, Safety, Industrial.
12. Sign, Safety.
13. Step, Truck.

18-5 HAZARDS ASSOCIATED WITH TRANSPORTATION ACTIVITIES

If, at times, additional hazards may be encountered, reference should be made to the specific chapter pertaining to that hazard for the selection of appropriate supplementary protective items. For example, if the additional hazard happens to be "exceptionally cold or hot temperatures" refer to chapter 15, "Special Safety Protective Clothing and Equipment for Extreme Temperatures and Weather Conditions."

18-6 ENSEMBLE, REFLECTIVE SAFETY CLOTHING MARKING (not issued as a unit)

BAND, ARM SAFETY: REFLECTIVE ORANGE FABRIC

Source: LIN B-23462
NSN 8465-00-177-4977

BAND, HELMET SAFETY: REFLECTIVE ORANGE FABRIC

Source: LIN B-24402
NSN 8415-00-177-4978

BAND, LEG SAFETY: REFLECTIVE ORANGE FABRIC

Source: LIN B-24512
NSN 8465-00-177-4975

BAND, SLEEVELET SAFETY: REFLECTIVE ORANGE FABRIC

Source: LIN B-24652

NSN 8465-00-177-4976

VEST, SAFETY: REFLECTIVE ORANGE FABRIC

Source: LIN Y-00950

NSN 8415-00-177-4974

Use: By individual required to perform MP duty or security guard duty; civilian policeman, airport and highway worker, traffic guard, railroad switchman; road guard; roads and grounds personnel; individual performing duty day or night requiring this protection NOA. Also for use by troops engaged in night marches or during periods of low visibility.

18-7 SELECTED PORTIONS OSHA STANDARDS — FEDERAL REGISTER — PART 1926 — CONSTRUCTION SAFETY AND HEALTH REGULATIONS — SUBPART G — SIGNS, SIGNALS, AND BARRICADES, SECTION 1926.200 — ACCIDENT PREVENTION SIGNS AND TAGS:

“Subpart G — Signs, Signals, and Barricades

“§ 1926.200 Accident prevention signs and tags.

“(a) *General.* Signs and symbols required by this subpart shall be visible at all times when work is being performed, and shall be removed or covered promptly when the hazards no longer exist.

“(b) *Danger signs.* (1) Danger signs (see figure G-1) shall be used only where an immediate hazard exists.

“(2) Danger signs shall have red as the predominating color for the upper panel; black outline on the borders; and a white lower panel for additional sign wording.

“(c) *Caution signs.* (1) Caution signs (see figure G-2) shall be used only to warn against potential hazards or to caution against unsafe practices.

“(2) Caution signs shall have yellow as the predominating color; black upper panel and borders; yellow lettering of ‘caution’ on the black panel; and the lower yellow panel for additional sign wording. Black lettering shall be used for additional wording.

“(d) *Exit signs.* Exit signs, when required, shall be lettered in legible red letters, not less than 6 inches high on a white field and the principal stroke of the letters shall be at least three-fourths inch in width.

“(e) *Safety instruction signs.* Safety instruction signs, when used, shall be white with green upper panel with white letters to convey the principal message. Any additional wording on the sign shall be black letters on the white background.

“(f) *Directional signs.* Directional signs, other than automotive traffic signs specified in paragraph (g) of this section, shall be white with a black panel and a white directional symbol. Any additional wording on the sign shall be black letters on the white background.

“(g) *Traffic signs.* (1) Construction areas shall be posted with legible traffic signs at points of hazard.

“(2) All traffic control signs or devices used for protection of construction workmen shall conform to American National Standards Institute D6.1-1971, Manual on Uniform Traffic Control Devices for Streets and Highways.

“(h) *Accident prevention tags.* (1) Accident prevention tags shall be used as a temporary means of warning employees of an existing hazard, such as defective tools, equipment, etc. They shall not be used in place of, or as a substitute for, accident prevention signs.

“(2) Specifications for accident prevention tags similar to those in Table G-1 shall apply.

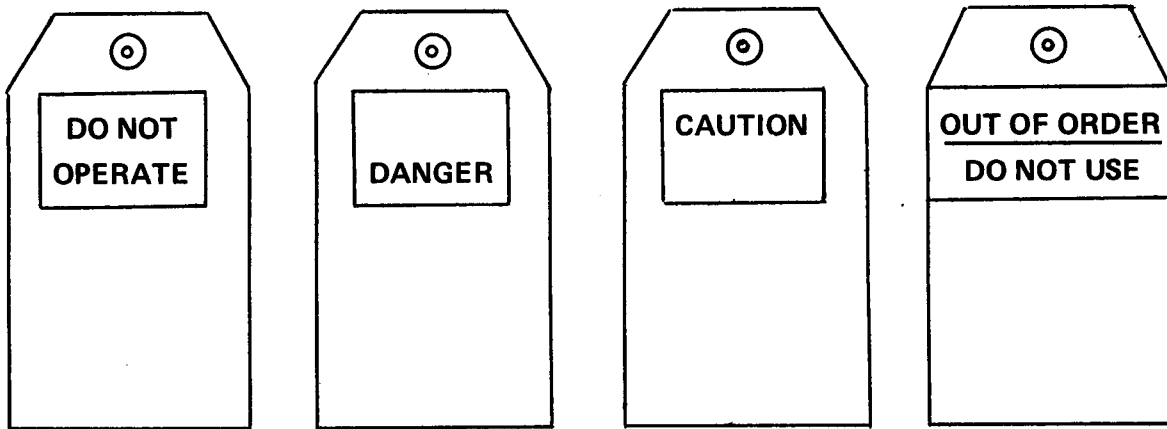
“(i) *Additional rules.* American National Standards Institute (ANSI) Z35.1-1972, Specifications for Accident Prevention Signs, and Z35.2-1968 (R1974), Specifications for Accident Prevention Tags, contain rules which are additional to the rules prescribed in this section. The employer shall comply with ANSI Z35.1-1972 and Z35.2-1968 (R1974) with respect to rules not specifically prescribed in this subpart.

“§ 1926.201 Signaling.

“(a) *Flagmen.* (1) When operations are such that signs, signals, and barricades do not provide the necessary protection on or adjacent to a highway or street, flagmen or other appropriate traffic controls shall be provided.

“(2) Signaling directions by flagmen shall conform to American National Standards Institute D6.1-1971, Manual on Uniform Traffic Control Devices for Streets and Highways.

TABLE G-1



White tag - White
letters on red
square

White tag - White
letters on red oval
with a black square

Yellow tag - Yellow
letters on a black
background

White tag - White
letters on black
background

Basic Stock (Background)	Safety Colors (Ink)	Copy Specification (Letters)
White	Red	Do Not Operate
White	Black and Red	Danger
Yellow	Black	Caution
White	Black	Out of Order Do Not Use

“(3) Hand signaling by flagmen shall be by use of red flags at least 18 inches square or sign paddles, and in periods of darkness, red lights.

“(4) Flagmen shall be provided with and shall wear a red or orange warning garment while flagging. Warning garments worn at night shall be of reflectorized material.

“(b) *Crane and hoist signals.* Regulations for crane and hoist signaling will be found in applicable American National Standards Institute standards.

“§ 1926.202 Barricades.

“Barricades for protection of employees shall conform to the portions of the American National Standards Institute D6.1-1971, Manual on Uniform Traffic Control Devices for Streets

and Highways, relating to barricades.

“§ 1926.203 Definitions applicable to this Subpart.

“(a) ‘Barricade’ means an obstruction to deter the passage of persons or vehicles.

“(b) ‘Signs’ are the warnings of hazard, temporarily or permanently affixed or placed, at locations where hazards exist.

“(c) ‘Signals’ are moving signs, provided by workers, such as flagmen, or by devices, such as flashing lights, to warn of possible or existing hazards.

“(d) ‘Tags’ are temporary signs, usually attached to a piece of equipment or part of a structure, to warn of existing or immediate hazards.

CHAPTER 19. SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR MATERIAL HANDLING AND STORAGE

19-1 INTRODUCTION

There are few, if any, occupations or military duties that do not involve the handling of various kinds of materials to some degree. Even with the sophisticated equipment, conveyor systems, and specialized mechanical devices available today, this area of industrial and military effort is still responsible for a large number of personal injuries every year.

Many of these injuries occur in the manual relocation of materials, boxes, crates, drums, and other objects, and are the result of improper procedures or of trying to handle or lift items that are too heavy. Instruction in correct gripping, lifting, and carrying techniques, as well as insistence on wearing suitable personal protective equipment, can do much to minimize injuries of this type.

Wherever possible and practical, mechanical aids and equipment should be substituted for muscle power. This, in itself, will reduce the exposure to lifting-type accidents, but, even in this case, the intelligent use of such equipment, observing good safety practices, and the wearing of proper personal safety equipment is necessary if injuries in this field of endeavor are to be prevented.

Information on signs, signals, and barricades is contained in chapter 18, "Special Safety Protective Clothing and Equipment for Transportation."

References considered pertinent to material handling and storage: TM 743-200; TM 743-200-1; and TM 743-200-3, all entitled "Storage and Material Handling."

19-2 SELECTED PORTIONS OF OSHA STANDARDS, PART 1910 – OCCUPATIONAL SAFETY AND HEALTH STANDARDS – SUBPART N – MATERIALS HANDLING AND STORAGE

"Subpart N of the OSHA standards establishes minimum requirements for safety and health protection in materials handling and storage. As

will be noted, the OSHA standards are concerned with the fire problems involved in storage and the use of powered equipment as well as with the accident aspects of materials handling equipment.

"Handling Materials—General (1910.176)

"a. **Use of Mechanical Equipment**—Allow sufficient safe clearances for aisles, at loading docks, through doorways and wherever turns or passage must be made. Keep aisles and passageways clear and in good repair, with no obstructions to create hazards. Permanent aisles and passageways must be appropriately marked.

"b. **Secure Storage**—Storage of materials must not create hazards. Bags, containers, bundles, etc., stored in tiers must be stacked, blocked, interlocked and limited in height to prevent sliding or collapse.

"c. **Housekeeping**—Keep storage areas free from accumulations of materials that could cause tripping, fires, or explosion, or harbor pests. Keep vegetation under control where necessary.

"d. **Drainage**—Provide proper drainage.

"e. **Clearance Limits**—Provide signs to warn of clearance limits.

"f. **Rolling Railroad Cars**—Before loading or unloading, install derails or bumper blocks at exposed ends of the car to prevent being struck by a free rolling car. To protect against being struck by a car attached to a locomotive, install derails or bumper blocks or else put a blue flag, light or disc next to the track as visual warning. Use hand brakes or wheel stops to prevent railroad cars from moving in loading or unloading.

"g. **Guarding**—Provide covers and/or guardrails to protect personnel from hazards of open pits, tanks, vats, ditches, etc.

"Powered Industrial Trucks (1910.178)

"a. **General Requirements**—1. Safety requirements in this section no longer concern only fire protection but also design, maintenance and use of fork trucks, tractors, platform lift trucks, motorized hand trucks, and other specialized industrial trucks powered by electric motors or internal combustion engines. The list of trucks and vehicles to which this section does

not apply still includes compressed air or non-flammable compressed gas-operated industrial trucks, and farm vehicles; but 'automotive vehicles for highway use' have been redefined as 'vehicles intended primarily for earth moving or over-the-road hauling.'

"7. There has been a change in the definition of 'approved truck' or 'approved industrial truck' as the terms are used in this section. The terms now mean that the trucks must be listed or approved for fire safety purposes, for the specific intended use, by nationally recognized testing laboratories such as Underwriters' Laboratories, Inc., or Factory Mutual Engineering Corp., which use nationally recognized testing standards.

"m. **Truck Operations**—5.i. When a powered industrial truck must be left unattended, it is no longer required that the key or connector plug be removed. It is still required to fully lower the load engaging means, neutralize controls, shut off power and set brakes. If the truck is parked on an incline, wheels are still required to be blocked. ii. A definition of 'an unattended powered industrial truck' has been added: it is a truck whose operator goes 25 feet or more away but keeps the truck in sight or whenever he does not keep it in his view. iii. No longer must power be shut off when an industrial truck operator dismounts from his vehicle but keeps it in view and moves no farther than 25 feet away; the operator is still required to fully lower the load engaging means, neutralize controls, and set brakes.

"m. 13. Revoked, to permit spinner knobs on steering wheels."

19-3 MATERIALS HANDLING GUIDE

"**Plant use** of powered industrial trucks presents a number of hazards to men, materials and equipment. All of these hazards can be controlled by the exercise of care and common sense.

"It is essential that operators assigned to drive powered trucks be physically fit and mentally alert. They should be properly trained for the job. Instruction should include an understanding of safe wearing apparel; safety shoes, for example, should be worn by all drivers. No employee should be permitted to operate a powered plant vehicle unless he is qualified by

specific training in the handling of that vehicle and is authorized to operate it. He must also be required to report any accident, or conditions in the plant which cause a near-accident, to his supervisor.

"While there are many types of powered trucks used in materials handling, certain guidelines for safe operation apply to them all.

"*Vehicle maintenance:* Before a truck is put into operation, tests should be made of the brakes, horn, clutch, steering mechanism and other devices for safety and ease of operation. A defective vehicle should be removed from service and reported immediately. Adjustments and repairs must be made only by authorized personnel.

"At intervals not exceeding 30 days, lifting and boom cables on trucks should be inspected for broken strands, corrosion, loose socket fastenings and other possible defects. Cables should be kept well lubricated. Spot checks should be made often, and faults repaired promptly.

"When a truck is refueled, the tank should be filled only in the open air, and never while the truck motor is running. Fuel should be conveyed in properly grounded hoses, not poured from open cans or buckets. After refueling, before the truck motor is started, the gas cap should be replaced and spilled oil or gasoline washed away.

"The operator who transfers from one truck to another in the course of his work should, in each case, first examine the truck and check controls; not all trucks are manufactured according to one standard or operated according to one system of procedure.

"*Loading and materials handling:* Powered truck operators realize that vehicles differ and loads differ; they must consider in advance of performance how each materials handling job can best be accomplished. When necessary, the supervisor should be consulted for suggestions and instructions.

"No well trained operator will use a truck to move a load for which it is not designed. Some common abuses and dangerous practices are: transporting people, pushing stalled vehicles, and pulling railroad cars.

"Use only designated areas for loading and unloading. Aisles and passageways through which trucks must move should be kept clear.

Do not permit anyone to stand or walk under an elevated load.

"Do not move a questionable or unsafe load. Inspect first for overload, loose material, poor balance. Get any necessary help before attempting to lift heavy, awkward, slippery or sharp-edged materials. If the truck is equipped with forks that can be spread, adjust them to suit each individual load's width. Knowledge of each truck's load-lifting capacity is essential so that it will not be exceeded.

"Ordinarily, no materials should protrude beyond the running lines of the truck. A warning flag should be used on large, protruding loads.

"Never permit any part of the load to obstruct driver's vision.

"Load materials so that they cannot fall off or shift while in transit; tie down or bind load as required.

"When moving explosive, highly flammable, toxic, corrosive or otherwise hazardous materials, be certain that all personnel are cleared from the exposed areas, and that all specified safety precautions are observed.

"Lift loads smoothly, avoiding sudden movements. Loads must not be carried in an elevated position on lift trucks, nor should loads be lifted or lowered while the truck is in motion.

"Do not use damaged loading plates or damaged pallets.

"Particular care should be taken when carrying or placing materials near unit heaters, electric wiring, lights, pipes, or other building equipment.

"Materials must be stacked or piled in a way that will prevent their tipping, sliding or falling. Do not overfill racks or bins used for storage.

"Note the posted safe floor loads so that capacity will not be exceeded. When in doubt concerning the weight of materials or the strength of floor supports, the operator should consult with his supervisor."

NOTE: Rated capacities (working load limit) for rigging equipment is found in the *Federal Register*, Part 1926 OSHA — Construction Safety and Health Regulations — Subpart H — Materials Handling, Use and Disposal for the following items:

Alloy Steel Chains
Wire Rope
Natural Rope and Synthetic Fiber

Synthetic Webbing (Nylon, Polyester, and Polypropylene)
Shackles and Hooks.

19-4 SPECIFIC ITEMS FOR MATERIAL HANDLING AND STORAGE ACTIVITIES

The items listed below are general in nature and have broad application in the field of material handling and storage rather than being specifically confined to any one area of endeavor. It is a user's guide only.

General equipment of this kind can be extremely useful in preventing accidents and should be used where it has application.

A. BRAKE, HAND TRUCK

A foot-actuated brake consisting of a set of lined brake shoes and heavy cross rod for mounting on industrial hand trucks.

Source: Appendix A

Use: By users of industrial hand trucks to provide additional safety when transporting heavy loads down a ramp or grade.

B. BLOCK TACKLE

Source: See SB700-20 and CTA 50-970 for various types and capacities.

C. CLAMP, LIFTING, CRANE (fig. 19-1)

A device designed to pick up steel plates, sheets, or structural members without the necessity of bolting or using slings. Clamps of this type only need sufficient flat surface for its jaws to grab. The weight of the lifted object creates the gripping power of the jaws, much in the same way an ice tong picks up a block of ice.

Source: Appendix A

Use: By crane men to safely lift and move steel plates, sheets, etc.

D. CLAMP, MATERIAL LIFTING: HORIZONTAL AND VERTICAL METAL PLATES

Source: Horizontal metal plates 0 to 2 in.
10,000 lb:
LIN E-27473
NSN 3940-00-242-3848
Horizontal metal plates 0 to 3 in.

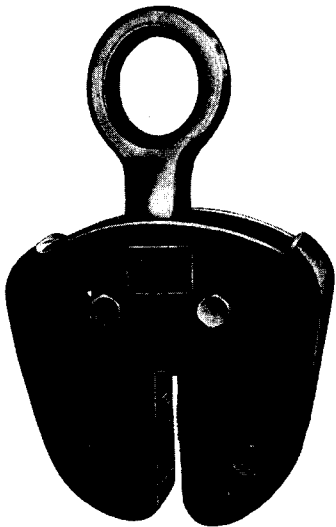


Figure 19-1. Clamp, Lifting, Crane.

24,000 lb:
 LIN E-27610
 NSN 3940-00-286-1541
 Vertical metal plates $\frac{1}{2}$ to $1\frac{1}{2}$ in.
 10,000 lb:
 LIN E-27747
 NSN 3940-00-242-3843

E. CLIP, WIRE ROPE STEEL (fig. 19-2)

Source: See CTA 50-970 for basis of issue and remarks.

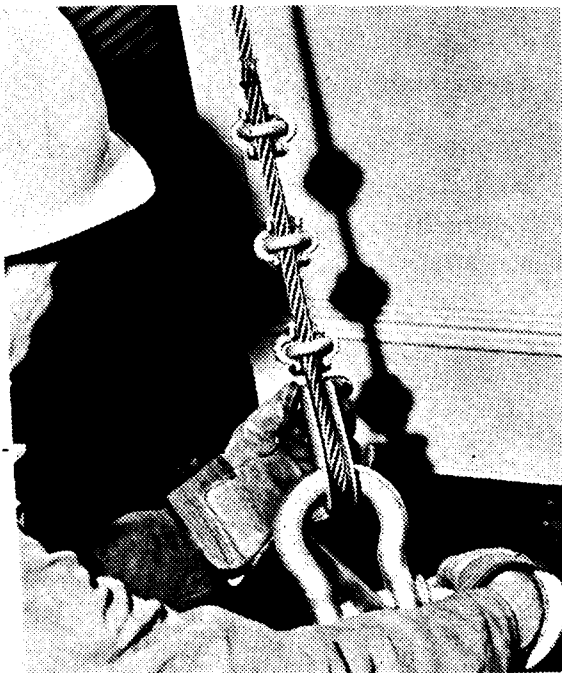


Figure 19-2. Clip, Wire Rope Steel.

F. HOIST (fig. 19-3)

Special purpose and capacities (chain, electric driven, hydraulic, wire rope, etc.).

Source: See SB700-20

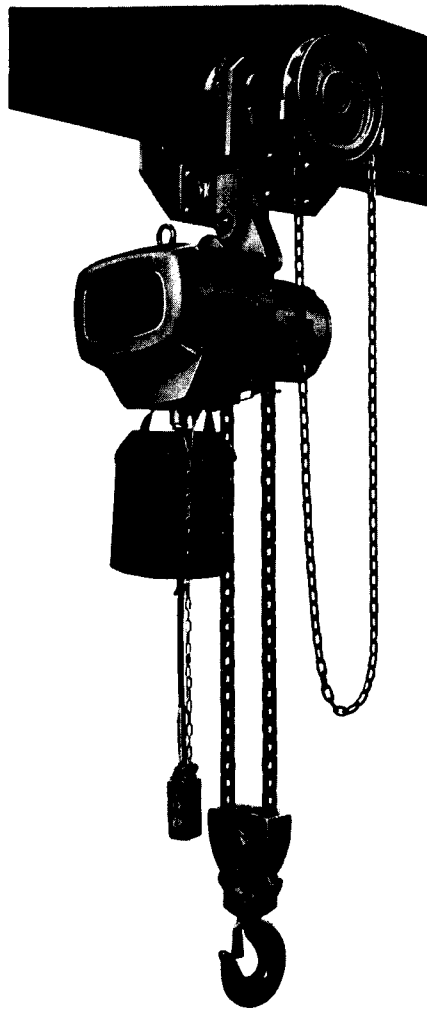


Figure 19-3. Hoist, Electric Type.

G. HOOK, HOIST, SAFETY (fig. 19-4, swivel, load rated 25 tons)

A hoist hook with safety latch.

Source: Appendix A

Use: By hoist crew to prevent slippage of load, or twisting of load from hook.

H. HOOK, SAFETY ATTACHMENT, HOIST (fig. 19-5; fig. 19-5A, swinger latch; fig. 19-5B, flapper latch)

A clamp-on collar with spring loaded latch

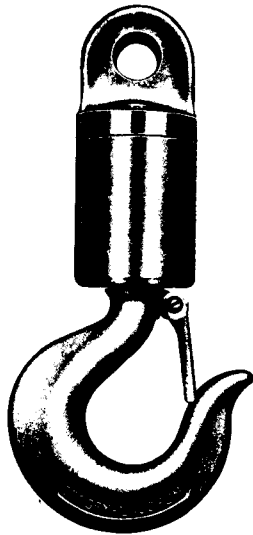


Figure 19-4. Hook, Hoist, Safety, Swivel, Load Rated 25 Tons.

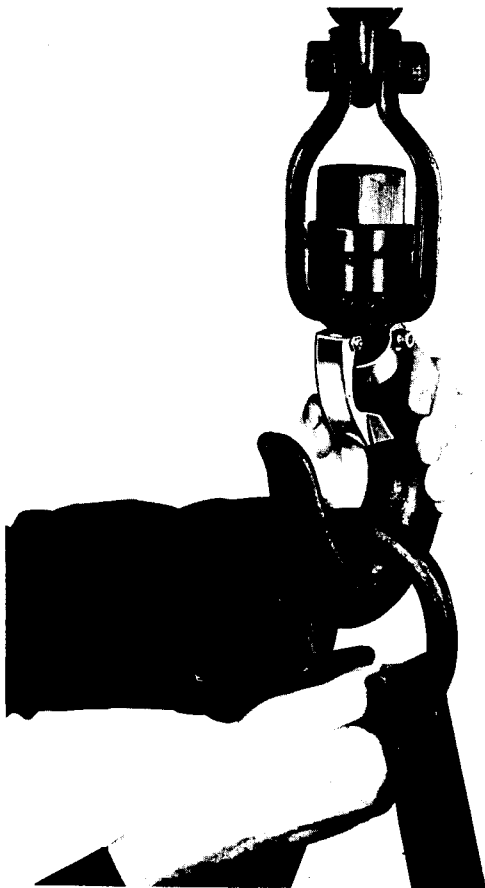


Figure 19-5. Hook, Safety Attachment, Hoist.



Figure 19-5A. Swinger Latch.



Figure 19-5B. Flapper Latch.

which closes the hook opening preventing dislodgement of load.

Source: Appendix A

Use: By crane men as a safety precaution.

I. HOOKS, SPECIAL PURPOSE AND CAPACITIES (CARGO AND SAFETY) (fig. 19-6, choker hook)

Source: See SB700-20

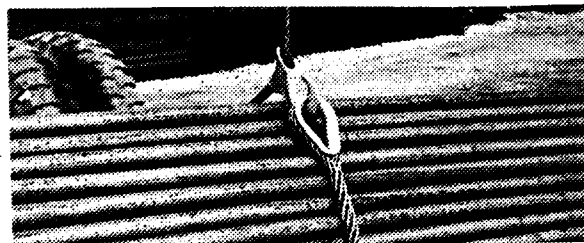


Figure 19-6. Choker Hook.

J. PAD, EYE STEEL 4 X 11 IN.

Source: NSN 2040-00-287-5519

Use: Per storage area shop.

K. RAMP, INCLINED, PORTABLE (fig. 19-7)

A portable lightweight metal ramp with a corrugated or other type of slip-proof surface for bridging the space between a truck bed and loading dock.

Source: Appendix A

Use: By shippers, receivers, truckers, material handlers, and others to facilitate loading and/or unloading of trucks or railroad cars when there is a gap between the truck or car and the dock, or to compensate for differences in elevation.



Figure 19-7. Ramp, Inclined, Portable.

L. RAMPS

Special purpose and capacities (vehicle loading)

Source: SB700-20

M. SAFETY LINK CRANE, HIGH VOLTAGE, INSULATED

With hook/ball 25 ton capacity

Source: LIN 04671A
NSN 000-00-004-671A

N. SEARCHLIGHT, INDC

Source: NSN 6230-00-299-5721

Use: Per storage area and work site as required; per MP organization team.

O. SHACKLES

Special purpose and capacities (suspension, anchor, anti-toppling and swivels). See figure 19-2 for typical anchor shackle.

Source: See SB700-20 and CTA 50-970 for NSN's, basis of issue and remarks.

P. SLINGS

Special purpose and capacities (cargo, aerial, nets paulins, etc.).

Source: See SB 700-20 and CTA 50-970 for NSN's, basis of issue and remarks.

Q. SLING CHAIN, WITH OVERLOAD WARNING LINK

Warning link so designed as to bend from its original shape and thus give early visual evidence of an overload condition.

Source: Appendix A

Use: By crane men to prevent accidents which would result from an overload condition.

R. SLING CHAIN, RELEASE

Solenoid-activated mechanism to release load.

Source: Appendix A

Use: By crane operator who can operate a push-button device to release load when on ground without exposing ground crewman to possible injury.

S. STEP, TRUCK

A retractable step of welded construction that may be bolted to a truck bed or cross frame and withdrawn as needed to provide safe access to the truck body.

Source: Appendix A

Use: By truckers and/or receiving personnel to provide safe access to a truck body.

19-5 GENERAL PROTECTIVE CLOTHING AND EQUIPMENT FOR MATERIAL HANDLING AND STORAGE OPERATIONS

The items listed below are applicable to

materials handling and are described in other chapters of this pamphlet. Refer to "Subject Item Index."

- (1) Apron, Welders, Leather Bib Type
- (2) Barricade
- (3) Can, Safety
- (4) Cap, Protective Maintenance Personnel: Adjustable
- (5) Coveralls, Safety, Fire, Oil Resistant
- (6) Covering, Nonslip, Floor and Stair
- (7) Cream, Barrier
- (8) Ear Plugs or Earmuffs
- (9) Face Shield, Industrial
- (10) Flag, Warning
- (11) Glasses, Safety, Spectacle Type
- (12) Gloves, Cloth
- (13) Gloves, Leather
- (14) Guard, Foot
- (15) Helmet, Construction Workers
- (16) Jacket, Safety
- (17) Shirt, Safety
- (18) Shoes, Safety, Industrial Workers
- (19) Sign, Safety
- (20) Stepladder, Safety Platform
- (21) Sweatband, Adjustable, White
- (22) Trousers, Safety

19-6 HAZARDS ASSOCIATED WITH MATERIALS HANDLING AND STORAGE ACTIVITIES

If, at times, additional hazards may be encountered, reference should be made to the specific chapter pertaining to that hazard for the selection of appropriate supplementary protective items. For example, if the additional hazard happens to be "Electrical," refer to chapter 13, "Special Safety Protective Clothing and Equipment for Electrical Hazards."

19-7 SELECTED PORTIONS OF OSHA STANDARDS, PART 1926 — CONSTRUCTION SAFETY AND HEALTH REGULATIONS — SUBPART N — CRANES, DERRICKS, HOISTS, ELEVATORS, AND CONVEYORS — SUBPART 1926.551 — HELICOPTERS

NOTE: This portion has been reproduced from OSHA material as it appears within the standards.

"§ 1926.551. Helicopters.

"(a) *Helicopter regulations.* Helicopter cranes shall be expected to comply with any applicable regulations of the Federal Aviation Administration.

"(b) *Briefing.* Prior to each day's operation a briefing shall be conducted. This briefing shall set forth the plan of operation for the pilot and ground personnel.

"(c) *Slings and tag lines.* Load shall be properly slung. Tag lines shall be of a length that will not permit their being drawn up into rotors. Pressed sleeve, swedged eyes, or equivalent means shall be used for all freely suspended loads to prevent hand splices from spinning open or cable clamps from loosening.

"(d) *Cargo hooks.* All electrically operated cargo hooks shall have the electrical activating device so designed and installed as to prevent inadvertent operation. In addition, these cargo hooks shall be equipped with an emergency mechanical control for releasing the load. The hooks shall be tested prior to each day's operation to determine that the release functions properly, both electrically and mechanically.

"(e) *Personal protective equipment.* (1) Personal protective equipment for employees receiving the load shall consist of complete eye protection and hard hats secured by chinstraps.

"(2) Loose-fitting clothing likely to flap in the downwash, and thus be snagged on hoist line, shall not be worn.

"(f) *Loose gear and objects.* Every practical precaution shall be taken to provide for the protection of the employees from flying objects in the rotor downwash. All loose gear within 100 feet of the place of lifting the load, depositing the load, and all other areas susceptible to rotor downwash shall be secured or removed.

"(g) *Housekeeping.* Good housekeeping shall be maintained in all helicopter loading and unloading areas.

"(h) *Operator responsibility.* The helicopter operator shall be responsible for size, weight, and manner in which loads are connected to the helicopter. If, for any reason, the helicopter operator believes the lift cannot be made safely, the lift shall not be made.

"(i) *Hooking and unhooking loads.* When employees are required to perform

work under hovering craft, a safe means of access shall be provided for employees to reach the hoist line hook and engage or disengage cargo slings. Employees shall not perform work under hovering craft except when necessary to hook or unhook loads.

“(j) *Static charge*. Static charge on the suspended load shall be dissipated with a grounding device before ground personnel touch the suspended load, or protective rubber gloves shall be worn by all ground personnel touching the suspended load.

“(k) *Weight limitation*. The weight of an external load shall not exceed the manufacturer's rating.

“(l) *Ground lines*. Hoist wires or other gear, except for pulling lines or conductors that are allowed to ‘pay out’ from a container or roll off a reel, shall not be attached to any fixed ground structure, or allowed to foul on any fixed structure.

“(m) *Visibility*. When visibility is reduced by dust or other conditions, ground personnel shall exercise special caution to keep clear of main and stabilizing rotors. Precautions shall also be taken by the employer to eliminate as far as practical reduced visibility.

“(n) *Signal systems*. Signal systems between aircrew and ground personnel shall be

understood and checked in advance of hoisting the load. This applies to either radio or hand signal systems. Hand signals shall be as shown in Figure N-1.

“(o) *Approach distance*. No unauthorized person shall be allowed to approach within 50 feet of the helicopter when the rotor blades are turning.

“(p) *Approaching helicopter*. Whenever approaching or leaving a helicopter with blades rotating, all employees shall remain in full view of the pilot and keep in a crouched position. Employees shall avoid the area from the cockpit or cabin rearward unless authorized by the helicopter operator to work there.

“(q) *Personnel*. Sufficient ground personnel shall be provided when required for safe helicopter loading and unloading operations.

“(r) *Communications*. There shall be constant reliable communication between the pilot, and a designated employee of the ground crew who acts as a signalman during the period of loading and unloading. This signalman shall be distinctly recognizable from other ground personnel.

“(s) *Fires*. Open fires shall not be permitted in an area that could result in such fires being spread by the rotor downwash.”

20-1 INTRODUCTION

This chapter is devoted to a series of items which are general in nature and have broad application in the field of safety, rather than being specifically confined to any one area of endeavor.

General equipment of this kind can be extremely useful in preventing accidents and should be used wherever it has application.

As previously stated, each job should be carefully analyzed to determine areas of potential hazard, and steps taken to provide protection against those hazards. In many cases, it will be found that one or more items in this chapter will contribute to increased safety on a particular job.

20-2 SPECIFIC ITEMS FOR MISCELLANEOUS SAFETY EQUIPMENT

A. CAN, FLAMMABLE WASTE (fig. 20-1)

Source: See CTA 50-970

NSN 7240-00-286-5342 —
per USA Depot
NSN 7240-00-282-8411 —
per Crafts Facility in Garrison
NSN 7240-00-256-7700 — 10 gal —
per ves LCM type, BD, F, J, LARC-V,
LARC-XV, Q, ST 50 ft through 65 ft,
per ves exc LCM type, FB, FS, FSR,
LT, CS, Y, LCM, ST over 65 ft, per ves
FMS

Use: Provides maximum protection against spontaneous combustible materials, such as oil-soaked rags or other flammable material.

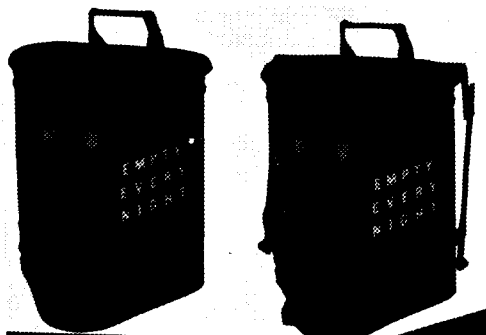


Figure 20-1. Can, Flammable Waste.

B. CLAMPS

Various styles and designs of metal clamps and holders for laboratory use, corrosion resistant, nonferrous, with various coatings to prevent slippage.

Source: Appendix A

Use: To safety support, grip, or tilt reaction vessels, glassware, tubing, etc.

C. CREAM, BARRIER

A protective cream which lays a barrier on the skin to prevent contact with irritants and subsequent skin reactions. Can be a film barrier type, plastic, silicone, soap, or waterproof or solvent-proof type.

Source: Appendix A

Use: In handling chemicals, oils, alkalis, acids, etc.; likely to cause skin irritation.

D. EMERGENCY PROCEDURES CHART: DANGEROUS CHEMICALS

This wall chart is a quick reference guide to the hazardous properties of dangerous liquids, solids, and gases and what emergency procedures should be instituted for chemical accidents. It indicates by a numerical scale the relative degree of flammability, reactivity, and danger from eye contact, breathing, skin contact, and swallowing.

Source: Appendix A

Use: For posting in laboratories of industries and schools and wherever chemicals are stored, handled, or used.

E. FIRST AID KIT, GENERAL PURPOSE: RIGID CASE

Source: LIN H-61179

NSN 6545-00-922-1200

F. FLOOR FINISH, ANTISKID, EMULSIFIED PLASTIC

An emulsified plastic, antiskid floor finish, which requires no polishing or buffing. May be used on all types of flooring. Easily removed with soap, water, and ammonia.

Source: Appendix A

Use: By maintenance and/or janitorial personnel for improving appearance and reducing wear on various types of floors while eliminating the slipping hazard.

G. FLOOR TREAD, ABRASIVE, FABRIC OR PLASTIC

A fabric or plastic antislip material coated with hard mineral grains, pressure sensitive or plain back. Available in rolls or cut pieces, various sizes.

Source: Appendix A

Use: On floors, stairs, around machines or any location where slipping is a hazard.

H. GUARD, DESICCATOR (fig. 20-2)

A metal container designed to enclose a laboratory desiccator.

Source: Appendix A

Use: To prevent injury from flying glass particles of a broken desiccator.

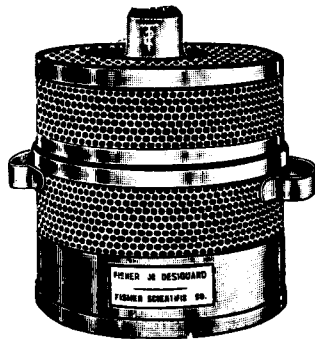


Figure 20-2. Guard, Desiccator.

I. HOOD, FUME (fig. 20-3)

A self-contained ventilated laboratory hood with fan-blower set and work space.

Source: LIN 00840A

See SB 700-20 for NSN's

Use: To remove dangerous fumes resulting from work or exposure of source of fumes in the hood before they are exhausted.

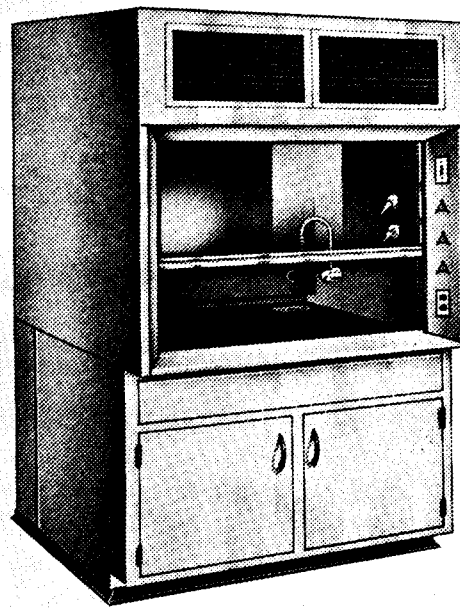


Figure 20-3. Hood, Fume.

J. ICE-REMOVING MATERIALS

Various types of granular chemicals that will melt ice on contact and furnish quick traction.

Source: Appendix A

Use: For melting or removing accumulations of ice from walks, steps, ramps, or runways.

K. INSECT REPELLANT, CLOTHING AND PERSONAL APPLICATION

A 6-ounce aerosol can containing repellent diethyl-metatoluamide.

Source: NSN 6840-00-082-2541

Fed Spec O-I-503

Use: Skin application for mosquitoes, biting flies, gnats, and fleas, or clothing treatment for protection against biting insects, chiggers (mites), fleas, and ticks.

Limitation: Use only in accordance with instructions on container.

L. INSECTICIDE, AEROSOL, SYNERGIZED PYRETHRINS

A 12-ounce aerosol can containing insecticide pyrethrin and piperonyl butoxide.

Source: NSN 6840-00-823-7849
Mil Spec O-I-507, Type 1

Use: An insect spray for the control of flying insects in closed spaces. Avoid prolonged or repeated inhalation of aerosol mist.

Limitation: Use only in accordance with instructions on container.

M. INSECTICIDE, LINDANE, POWDER, DUSTING

A 2-ounce can containing lindane insecticide dust.

Source: NSN 6840-00-242-4217
Mil Spec I-11490

Use: To protect individuals from infestations of body lice, pubic lice, head lice, fleas, and bedbugs.

Limitation: Use only in accordance with instructions on container.

NOTE: See CTA 50-970 for additional insecticides.

N. LEVELER, LADDER

An adjustable fitting for attaching to ladder rails to permit independent height adjustment of rails on uneven surfaces, equipped with nonslip shoes, rubber or spiked.

Source: NSN 5440-372-0686

Use: To permit independent height adjustment of ladder legs on uneven surfaces.

O. LIP BALM, COLD AND HOT WEATHER

A balm for protection against sun's rays, wind, and moisture.

Source: Appendix A

Use: For personnel working in conditions exposed to extreme weather.

P. LOCKOUT, MULTIPLE, ELECTRICAL SWITCHES AND VALVES (fig. 20-4)

Two integrated pieces of formed steel containing several sets of matching holes for accommodating a number of different padlocks. Switch lever or valve cannot be operated until all locks have been removed.

Source: Appendix A

Use: By maintenance personnel (each trade uses

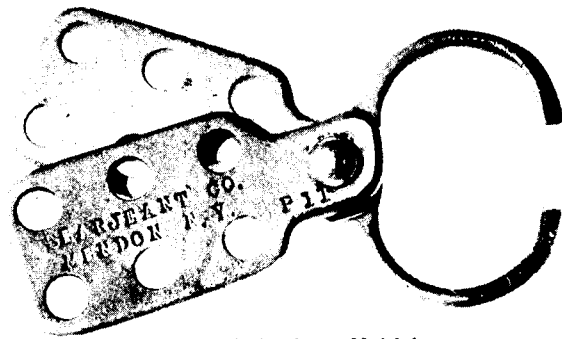


Figure 20-4. Lockout, Multiple, Electrical Switches and Valves.

a different lock) for preventing inadvertent start-up of processes or machinery while undergoing repair.

Q. MAT, METAL LINK

A flexible, roll-up-type metal mat that is impervious to oil, grease, or water.

Source: Appendix A

Use: In mills, machine shops, loading areas, and other locations where a heavy and durable-type mat is required to provide a secure, dry footing.

R. MAT, PLASTIC LINK

A nonabsorbent, nonporous mat with rust resistant wires and corrugated surface links.

Source: Appendix A

Use: To provide safe footing in areas of heavy pedestrian traffic, such as building entrances, lobbies, reception rooms, etc.

S. MAT, RUBBER LINK

A flexible, resilient-type mat of oil-resistant synthetic rubber.

Source: Appendix A

Use: By machine operators and others to reduce fatigue and where insulation from cold surfaces or from possible electrical shock are factors.

T. MAT, WOOD LINK

An integrated wood-link mat with tapered ends.

Source: Appendix A

Use: By machine operators and others to provide a safe, dry, and comfortable footing at their workplace.

U. METER, AIR VELOCITY

A meter with accessories for measuring the velocity of air in air conditioning systems, heating systems, etc.

Source: LIN 54830N

Use: By personnel in occupational medicine or preventive medicine (PVNTMED) programs or by safety officer when occupational medicine or PVNTMED personnel are not available.

V. METER, FOOT CANDLE, PHOTOELECTRIC: ME-86/U

A portable device for measuring light intensity.

Source: LIN M-38198
NSN 6695-00-641-5083

Use: By personnel in occupational medicine or preventive medicine (PVNTMED) programs, or by safety officer when occupational medicine or PVNTMED personnel are not available.

Reference: TB9-6695-241-50

W. METER, KIT, AIR FLOW RATE INDICATING

A float-type flow meter with set of three or four rotometers with stands and case.

Source: Appendix A

Use: By personnel in occupational or PVNTMED programs.

X. MIRROR, SAFETY

A convex mirror made of either glass or plastic with metal bezel and mounting bracket.

Source: Appendix A

Use: For mounting at cross aisles or blind corners as a means of alerting both pedestrians and vehicle operators of the approach of other traffic, thereby preventing collision-type accidents.

Y. OINTMENT, SUNBURN, PROTECTIVE

A lotion or cream providing maximum protection from sun's rays by absorbing those rays which cause sunburn.

Source: Appendix A

Use: By personnel exposed to bright sunlight.

Z. PAINT, LUMINOUS:PHOSPHORESCENT

A special paint (nonpoisonous) that will glow in the dark after being energized by exposure to light.

Source: Appendix A

Use: By marking emergency equipment and hazardous areas or objects to improve visibility in poorly lighted areas or at night.

Limitation: Must be reenergized at least daily by exposure to a natural or artificial light source.

AA. PSYCHROMETER: ML-24 (fig. 20-5)

Consists of two thin-bulb, mercury-filled thermometers which are clamped rigidly into the case. The wick of the wet-bulb thermometer leads into the instrument's water reservoir. The instrument is ready for use when the psychrometer case is pulled from the handle-holder and hangs free on the swivel hook.

Source: LIN P-83413
NSN 6660-00-223-5083

Use: This instrument is used to determine relative humidity to indicate the effectiveness of air conditioning and heating systems, etc.

NOTE: See SB700-20 for other types.

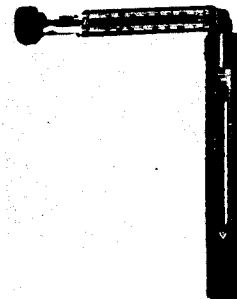


Figure 20-5. Psychrometer: ML-24.

BB. PYROMETER

A portable temperature-measuring instrument for ranges from 0° to 2300° F.

Source: LIN P-98462
NSN 6685-00-243-9988

Use: A noncontact method for determining temperatures in high-temperature work where the source is emitting visible light.

Reference: TB 11-6685-303-5011

NOTE: See SB700-20 for other types.

CC. RODENT SURVEY SET

A set composed of various chemicals, such as alcohol, arsenic, chloroform, ether, etc., forceps, gloves, traps, instruments.

Source: LIN S10157

NSN 6545-00-952-2175

Use: To survey rodent populations in the field.

DD. SHIELD, SAFETY, GLASS OR PLASTIC (fig. 20-6, three panel shield)

A fabricated glass (laminated) or plastic shield for mounting in front of, over, or around experimental equipment in a laboratory. Available in various sizes.

Source: Appendix A

Use: By technicians, research workers, or laboratory personnel to provide eye, face, and/or body protection during experiments involving heat and/or pressure.

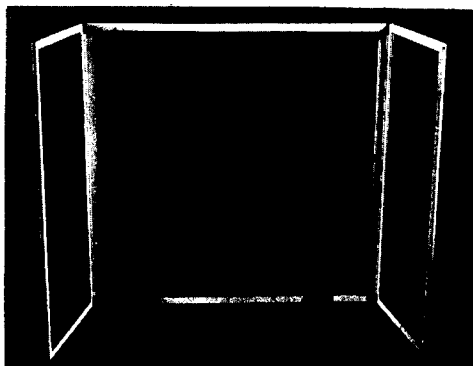


Figure 20-6. Shield, Three Panel, Safety, Glass or Plastic.

EE. SHOES, LADDER, SAFETY (fig. 20-7)

A hinged fabricated metal shoe or foot for attaching to the end of a ladder rail, rubber or spiked base.

Source: NSN 5440-00-592-1004

(spiked base)

Mil Spec S-18363

Use: To prevent ladders from slipping on supporting surface.

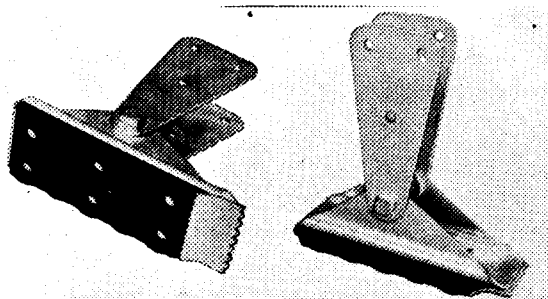


Figure 20-7. Shoes, Ladder, Safety.

FF. SIGN, SAFETY

Industrial safety signs, made of heavy gauge metal or plastic, brightly colored, varied sizes.

Source: Appendix A

Use: To warn visitors, workers, and passersby of hazardous conditions or point directions and remind personnel of required safety precautions.

NOTE: Also see Signs, Signals, and Barricades, chapter 18.

GG. STAIR TREAD, ANTISLIP, RUBBER OR SYNTHETIC

An abrasion-resistant molded rubber or synthetic tread with textured surface.

Source: Appendix A

Use: For application to steps or stairs to minimize slipping.

HH. STAIR TREAD, ROLLED METAL

A long wearing, fireproof, steel, stair tread with a pattern of raised lugs.

Source: Appendix A

Use: For general use on stairs in industrial plants, warehouses, commercial buildings, etc., to minimize slipping.

II. STEPLADDER, SAFETY PLATFORM

A fixed-type metal ladder with hand bars at the top, mounted on retractable rollers that move upward as weight is applied to the steps, thereby providing a solid base. Available in various sizes.

Source: LIN 47870N

Use: By personnel requiring use of a ladder NOA.

JJ. STOPWATCH: TYPE B TIMER, ELGIN 16, SIZE 7, JEWEL

A watch with sweep second hand and stop, start and reset control for accurately measuring small time intervals in seconds or hundredths of an hour.

Source: LIN U-43229

NSN 6645-00-240-7162

Use: By chemical security and chemical technicians escort detail personnel, safety officers, fire departments, CBR service parties, provost marshal security personnel WAB commanding officer, surveillance crews, chemical laboratory personnel, chemical arctic test teams, chemical desert test teams, and chemical tropical test teams.

KK. STRIP, SAFETY, TELEPHONE AND ELECTRIC LINES

A tapered, hollow raceway to conceal and protect telephone, electric lines, and extension cords that must be run on top of floor surfaces.

Source: Appendix A

Use: To conceal and protect wiring run across the floor in order to minimize tripping hazards.

LL. SUNSCREEN, OINTMENT

A suncreening agent in a vanishing cream base. Affords protection from infrared and ultra-violet rays.

Source: Appendix A

Use: For welders, cutters, and persons working in sunlight.

MM. TAPE, LUMINOUS

A luminous adhesive cloth tape available in convenient roll forms in various widths. Can be daylight fluorescent (extra bright), night luminous (phosphorescent) or reflective tape with a beaded surface for high visibility.

Source: NSN 9390-00-753-3208

Use: To indicate switches, exits, traffic lanes, stairs, fire equipment, danger spots.



Figure 20-8. Tester, Ventilation, Smoke Tube Assembly, MSA or Equal.

NN. TESTER, VENTILATION, SMOKE TUBE ASSEMBLY, MSA OR EQUAL (fig. 20-8)

A hermetically sealed glass tube with aspirator bulb and short section of rubber tubing connecting the two. Tube contains a granular chemical, which gives off a highly visible gray-white smoke when air is drawn through it.

Source: LIN 57590N

Use: By safety officer and preventive medicine personnel for estimating the velocity of slow-

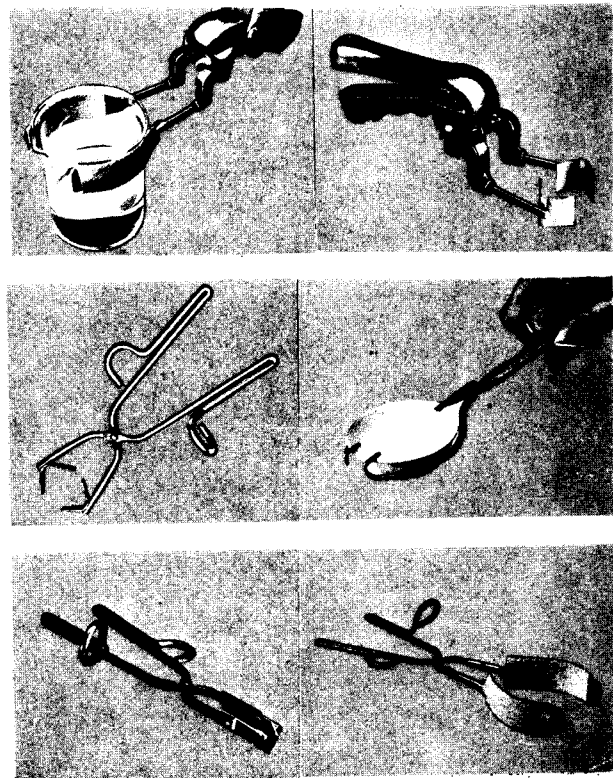


Figure 20-9. Tongs, Small Objects.

moving air currents by timing the travel of smoke given off by the tube.

OO. TONGS, SMALL OBJECTS (fig. 20-9)

A set of tongs with spring loaded grasp and

release. Available in various lengths.

Source: Appendix A

Use: To grasp and release small radioactive or otherwise dangerous objects in the laboratory.

APPENDIX A SAFETY DIRECTORY

This appendix contains a list of typical companies that manufacture, distribute, or supply protective clothing and safety equipment. This list is provided only as a guide to representative types of sources of the protective clothing and equipment available under each heading. The list is not complete, and should not be considered either complete or all-inclusive. The user of this pamphlet should consult local telephone directories and local catalogs for manufacturers, distributors, suppliers, and other sources of protective clothing and safety equipment. Names of manufacturers and trade names are provided as representative examples only. Their inclusion in this pamphlet does not imply indorsement by the Army, nor does exclusion of other manufacturers' names or trade names imply nonindorsement by the Army. This listing will be expanded and revised in future revisions of this pamphlet. The headings in this appendix correspond to the chapter headings found in the pamphlet.

CHAPTER 3 - RESPIRATORY HAZARDS AND PROTECTION

Respirators

American Optical Corporation, Southbridge, MA
Bausch and Lomb, Rochester, NY
Brinks Manufacturing Company, Franklin Park, ILL
Cesco Safety Products, Kansas City, MO
Devilbliss Company, Toledo, OH
Glendale Optical Company, Woodbury, NY
Pulmosan Safety Equipment, Flushing, NY
Scott-Acme Products, South Haven, MI
Scott Aviation, Lancaster, NY
Welsh Manufacturing Company, Providence, RI
Wilson Products Division, Reading, PA

Detector Tubes

Bachrack Instrument Company, Pittsburgh, PA
Mine Safety Appliances, Pittsburgh, PA
National Environmental Instruments, Warwick, MA
National Mine Service Company, Pittsburgh, PA
Union Industrial Equipment Corporation, Fall River, MA

CHAPTER 4 - PROTECTION FOR THE HEAD, FACE, EYE, AND EAR

Head

American Industrial Safety Equipment Company, Cleveland, OH
Mine Safety Appliances Company, Pittsburgh, PA
United States Safety Service Company, Kansas City, MO

Face

American Optical Corporation, Southbridge, MA
Fyrepel Products, Newark, OH
Kedman Company, Salt Lake City, UT
Southeastern Safety Appliances, Inc., Atlanta, GA, and Raleigh, NC

Eye

American Optical Corporation, Southbridge, MA
Bausch and Lomb, Rochester, NY
Mine Safety Appliances, Pittsburgh, PA
Safety Services and Supply Company, Houston, TX

Ear (Protectors and Instruments)

American Optical Company, Southbridge, MA
Koss Corporation, Milwaukee, WI
Norton Company, North Hollywood, CA
Precision Acoustics Corporation, New York, NY

CHAPTER 5 - PROTECTIVE BODY CLOTHING

Boss Manufacturing Company, Kewanee, IL
Mine Safety Appliances, Pittsburgh, PA
Southeastern Safety Appliances, Inc., Atlanta, GA
United States Safety Service Company, Kansas City, MO
Wheeler Protective Apparel, Inc., Chicago, IL

CHAPTER 6 - PROTECTIVE FOOTWEAR

American Footwear Corporation, Fitchburg, MA
Cedar Crest Boot Company, Nashville, TN
Ellwood Safety Appliance Company, Ellwood City, PA
Lehigh Safety Shoe Company, Endicott, NY
LaCrosse Rubber Mills Company, LaCrosse, WI

CHAPTER 7 - PROTECTIVE HANDWEAR

American Optical Corporation, Southbridge, MA
Best Manufacturing Corporation, Menlo, GA
Charkate Glove and Specialty Company, Whitestone, Long Island, NY
Wheeler Protective Apparel, Inc., Chicago, IL

CHAPTER 8 - SAFETY BELTS, LIFELINES, AND LIFESAVING EQUIPMENT

Belts/Lifelines/Nets

Atlas Safety Equipment Company, Brooklyn, NY
Mathias Klein and Sons, Inc. Chicago, IL
Miller Equipment Division, ESB, Inc., Franklin, PA

Life Preserver, Rings, and Vest

Atlantic-Pacific Manufacturing Corporation, Brooklyn, NY
Delgrosso Brothers, Franklin, NY 07416

CHAPTER 9 - SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR AVIATION

Blank

CHAPTER 10 - SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR BIOLOGICAL HAZARDS

Protective Clothing

Charkate Glove and Specialty Company, Whitestone, Long Island, NY
Defense Apparel, Hartford, CT
Durafab Disposables, Inc., Cleburne, TX

Gloves, Arm Length Synthetic For Glove Box

Charleston Products Co., Charleston, SC
Defense Apparel, Hartford, CT

Laboratory Safety Products

Anderson 2000, Inc., Atlanta, GA (sieve samplers)
Science Related Materials, Inc., Janesville, WI
Scientific Products, Evanston, IL (slit samplers)
Standard Safety Equipment Company, Palatine, IL

CHAPTER 11 - SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR CHEMICAL HAZARDS

Protective Clothing

Boss Manufacturing Company, Kewanee, IL
Jomac Products, Inc., Warrington, PA
Mine Safety Appliances, Pittsburgh, PA
Wheeler Protective Apparel, Inc., Chicago, IL

Laboratory Safety Products

See Biological - Chapter 10

CHAPTER 12 - SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR CONSTRUCTION AND DEMOLITION

See references in chapters 3, 4, 5, 6, 7 and 8

CHAPTER 13 - SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR ELECTRICAL HAZARDS

Protective Equipment - Lineman's

Fyrepel Products, Inc., Newark, OH
Mine Safety Appliances, Pittsburgh, PA
Salisbury and Company, Skokie, IL

Rubber-Insulating Equipment

Miller Equipment Division, ESB, Inc., Franklin, PA
Salisbury and Company, Skokie, IL

Tester Equipment

General Radio Company, Concord, MA
Hanco International Division, Hannon Electric Company, Canton, OH
Mine Safety Appliances, Pittsburgh, PA
W. E. Anderson, Inc., Kansas City, MO

CHAPTER 14 - SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR FIRE, HEAT, AND EXPLOSION

Protective Clothing

Alb Rubber Company, Somerville, MA
Fyrepel Products, Inc., Newark, OH
Mine Safety Appliances Company, Pittsburgh, PA
Steel Grip Safety Equipment Company, Danville, IL
Wheeler Protective Apparel, Inc., Chicago, IL

Fire Extinguishers Portable

Ansul Company, Marinette, WI
Pem-All, Cranford, NJ

CHAPTER 15 - SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR EXTREME TEMPERATURE AND WEATHER CONDITIONS

Fyrepel Products, Inc., Newark, OH
Refrigi Wear, Inc., Inwood, NY

CHAPTER 16 - SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR PROTECTION AGAINST RADIANT ENERGY AND LIGHT ENERGY

Protective Clothing

See references for Biological and Chemical

CHAPTER 17 - SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR HANDLING FUEL

Protective Clothing

See references for Biological, Chemical and Fire, Heat and Explosion

CHAPTER 18 - SPECIAL SAFETY PROTECTIVE CLOTHING AND EQUIPMENT FOR TRANSPORTATION

Vehicle Equipment (Alarms, Warning Lights, etc.)
Smith and Wesson, Springfield, MA
Warn Industries, Seattle, WA

CHAPTER 19 - SPECIAL PROTECTIVE CLOTHING AND EQUIPMENT FOR MATERIAL HANDLING AND STORAGE

Equipment Company of America, Hialeah, FL
Harrington Company, Plymouth Meeting, PA
Miller Equipment Division, ESB, Inc., Franklin, PA
Pendergast Safety Equipment Company, Philadelphia, PA
The Crosby Group, Tulsa, OK
Morse Manufacturing Company, Inc., Syracuse, NY

CHAPTER 20 - MISCELLANEOUS SAFETY EQUIPMENT

Dome Laboratories, West Haven, CN
G.S. Herbert Laboratories, Irvine, CA
Holland Company, Inc., Lexington, NC
Miller-Morton Company, Richmond, VA
Mine Safety Appliances, Pittsburgh, PA
New Jersey Safety Appliances, Inc., Atlanta, GA, and Raleigh, NC
Southeastern Safety Equipment Company Union, NJ

APPENDIX B SAFETY ITEM INDEX

A

Adapter, Compressed Air, Breathing Apparatus, M4	20	Apron, Meat Cutter's	50
Adapter, Oxygen Supply, CB Mask Aircraft, ABC-M8	20	Apron, Nuclear Radiation Protective	131
Air Pilots, Crews, and Passengers, Chapter 9	74	Apron, TAP: Cotton Cloth, Rubber Coated, OD	83
Air Mover	140	Apron, Welder's, Asbestos, Leg Length	50, 106
Air Sampler, 110-V AC and 24-V DC Battery Operated	15	Apron, Welder's: Leather, Bib, Strap	50
Air Sampler, Sieve and Slit	81	Armor, Body, Fragmentation, Protective	50, 51, 106
Air Sampling Pump	15	Aural Protector, Sound	45
Alarm, Carbon Monoxide Automatic	15	Autotransformer	97
Alarm, Chemical Agent, Automatic Portable, M8 and M10 through M18	13	Axe, Ice, Mountain	119
Alarm, G-Agent, Automatic, Fixed Installation, M5	14	B	
Alarm, Truck Back Up	146	Badge, Film	131
Anklets, Women's: Cotton, Heavy Weight	58	Bag, Flying Helmet	74
Anti-Fogging Kit and Anti-Fogging Station	44	Bag, Lineman's Glove, for Gloves, Rubber, Voltage Rating Proof	97
Apron, Blacksmith: Bib-Type, Leather	49	Band, Arm Safety: Reflective Orange Fabric	149
Apron, Construction Workers: Bib-Type, Cotton	49	Band, Helmet Safety: Reflective Orange Fabric	149
Apron, Construction Workers: Waist-Type, Cotton	50	Band, Leg Safety: Reflective Orange Fabric	149
Apron, Impermeable: Duck, Rubber-Coated, Black	50	Band, Sleevelet Safety: Reflective Orange Fabric	150
Apron, Laboratory, Plastic, Colorless, Bib-Type	50	Barricade (See also Signals, Signals, and Barricades — Chapter 18)	147
		Belt, Ladder, Safety	71

Belt, Safety, Body Type	71	Boots, Combat: Men's, Leather, Black, Mildew Resistant, DMS, 10½ in. High	58, 85
Belt, Safety, Industrial, Lineman's Type, With Safety Strap	71, 97	Boots, Combat: Women's Leather, Black, Mildew Resistant	58
Belt, Safety, Suspension Type, Bosun's Type	71	Boots, Extreme Cold Weather: Men's Rubber, White	119
Biological Hazard Tags	80	Boots, Fireman's	107
Blanket, Fireproof	107	Boots, Fireman's, Insulated	107
Blanket, Fire, with Case: For Wall Mounting	107	Boots, Fireman's, Rubber, Knee Length 15 in. High, Antisole, Steel Toe	108
Blanket, Fire: Wool, with Grommets and Rope Handle	107	Boots, Fireman's: Rubber, Black, 13½ in. High	108
Blanket, Nuclear Radiation Protective	130	Boots, Hot Weather: Men's, Leather, and Nylon Duck	120
Blanket, Powder, Cotton	107	Boots, Hot Weather: Men's, Leather and Nylon, DMS, Spike Resistant	120
Blanket, Rubber, Electric Line	97	Boots, Hip: Men's, Rubber, Black	59
Blanket, Wool, Chemical Treated	107	Boots, Hip, Oil Resistant	59
Blasting Machine	107	Boots, Knee: Men's, Rubber, Black, Cleated Sole and Heel	59, 144
Blasting Machine: Plunger- Operated	107	Boots, Lineman's	98
Block Tackle	154	Boots, Radiation	131
Body Armor	50, 51	Boots, Safety: Knee, Rubber With Safety Toe and Steel Shank	59
Boots, Climber's: Blucher Style, Steel Box Toe, Leather, Black, 9 in.	58	Boots, Safety: Nonmarking Sole and Heel, Nonconductive, 8 in.	59, 98
Boots, Cold Weather: Men's, Rubber, Black, With Sealed Insulation	119	Boots, Safety: 8 in., Steel Cap and Toe, Neoprene Sole and Heels	59
Boots, Cold Weather: Men's, Rubber, Black	119	Boots, Ski, Mountain: Man's Leather, Black	120
Boots, Combat: Men's, Leather, Black, 10½ in. High, Orthopedic Use	57		

Boots, Toxicological Agents, Protective (TAP): M2A1	60, 83, 91
Brake, Hand Truck	154
Breathing Apparatus, Oxygen- Generating, M20	20, 144
Breathing Apparatus, Self-Contained, Demand Type M23	20
Breathing Apparatus, Self-Contained, M15	20
Breathing Apparatus, Self-Contained, Pressure Demand	20
C	
Cabinet, Storage	108
Cage, Animal	81
Calculator Set, Radiac and Nuclear Yield: ABC-M28A1	131
Calibrator, Radiac AN/UDM-6	131
Calibrator, Radiac, TS-784/PD	132
Can, Gasoline	141
Can, Safety, Flammable Liquid	108
Can, Flammable Waste	160
Cap, Clean Room: White Orlon/Dacron	36
Cap, Cold Weather: Cotton Nylon, Oxford, OG107	120
Cap, Miners, With Lamp	36, 109
Cap, Protective Maintenance Personnel: Adjustable	36
Cap, Protective Maintenance Personnel: Adjustable Flameproof Cotton Twill	37, 109
Cap, Protective Maintenance Personnel: Male and Female, Leather	37, 109

Cap, Protective Maintenance Personnel: Painters Cotton	37
Cap, Protective Maintenance Personnel: Powder Shop, White Drill	37, 108
Cap, Protective Maintenance Personnel: Women, Adjustable Fabric, Hair	37, 109
Cap, Protective, Welders, With Lugs For Use With Welding Hemlet	109
Carrier, Explosives	109
Case, Flying Helmet and Oxygen Mask	74
Chaps, Leather	51
Charger, Radiac Detector, PP-1578/PD	132
Clamp, Grounding	98
Clamp, Lifting, Crane	154
Clamp, Material Lifting: Horizontal and Vertical Plates	154
Clamps, Laboratory	160
Climbers, Set, Tree and Pole	98
Clip, Wire Rope Steel	155
Clothing Outfit, Chemical Protective Ensemble	89
Coat, Cold Weather: Man's, Cotton and Nylon, WR, Sateen With Liner	121
Coat, Cold Weather: Man's, Cotton, WR, 9 oz, OG107	121
Coat, Cold Weather: Cotton, WR, Sateen, OG107	121
Coat, Cold Weather: Women's, Cotton-Nylon, WR, Sateen, OG107	121

Coat, Dog Attack Training	55	Coveralls, Safety, Industrial, Fire-, Oil-, Water-, and Chemical- Resistant	52, 132
Coat, Fireman's: Asbestos Aluminum Coated FR/WR	111	Coveralls, TAP, Air Fed,	91
Coat, Fireman's: Cotton Sateen 107 FR/WR	109	Coveralls, TAP, Cotton, Airplane Cloth	83
Coat, Nuclear Radiation Protective	132	Crampons, Mountain: Steel, Electro- galvanized Finish	122
Combustible Gas Indicator Set, Portable	15	Cream, Barrier	160
Cone, Traffic	147	Creepers, Ice, Steel	122
Conversion Kit, Explosimeter No. 2	110	Cuff, Dog Attack Training	55
Cover, Footwear, TAP: Cotton Duck, OD177	83	Curtain, Welding	110
Coveralls, Cold Weather Mechanics: OG106	121		
Coveralls, Explosive Handlers	51, 110	D	
Coveralls, Explosive Handlers: White, Powder Jean, Closed Waist, Cover Shoe	110	Decontaminating Agent: Biological	81
Coveralls, Flying Antiexposure: Nylon Ripstop, Orange Yellow	74	Decontaminating Apparatus, Portable M-2, M11	86
Coveralls, Men's: Arctic for Extreme Temperature	122	Decontaminating and Reimpregnating Kit, Individual M13	86
Coveralls, Men's: White Cotton Sateen Carded 8.8 oz	52	Detector Kit, Carbon Monoxide, Colorimetric, M23	11
Coveralls, Nuclear Radiation Protective	132	Detector Kit, Chemical Agent, ABC-M18A2	11
Coveralls, Rocket Fuel Handler's: Full Protection, Butyl Rubber	144	Detector Kit, Chemical Agent, VGH, AN-MI5A2A and AN-M15A2N	12
Coveralls, Rocket Fuel Handler's: Limited Protection, Butyl Rubber	143	Detector Kit, Gas Precision	14
Coveralls, Safety, Industrial: Cotton Sateen White	51, 109	Detector Kit, Multi-Gas	14
Coveralls, Safety, Industrial: Polyester Tan	52	Detector Kit, Universal Testing	14
		Detonator, Vehicle Operators Reaction Time	147
		Dispenser Cabinet Lens Paper	44
		Dog Attack Training Ensemble	55

Drawers, Cold Weather: Men's 50% Cotton - 50% Wool Knit, Ankle Length, and Undershirt	122
Drawers, Extreme Cold Weather: Thermal or Insulated, Drawers and Undershirt	122
Drawers, Men's, Cotton, Thigh Length	52
Drawers, Men's: Wool Knit, Ankle Length, Silver Grey	122
Dust Counting and Particle Sizing Equipment	16

E

Ear Canal, Caps	45
Ear Plug	45
Earmuffs	45
Electromagnetic Warning Symbol	137
Emergency Procedures Chart — Chemicals	160
Ensemble, Aluminum Asbestos Fire Fighter's Clothing	111
Ensemble, Clothing Outfit Chemical Protective	89
Ensemble, Dog Attack Training	55
Ensemble, Protective Outfit, Impermeable, Supplied Air, M-5	91
Ensemble, Reflective Safety Clothing Marking	149
Ensemble, Rocket Fuel Handler's Full Protection Clothing	144
Ensemble, Rocket Fuel Handler's Limited Protection Clothing	144
Ensemble, Toxicological Agents Protective	83, 92

Ensemble, Vesicant Gas Protective	89
Exhauster, Welding Fume	111
Explosimeter, Model 2	111
Explosimeter, Model 4, Oxygen and Acetylene	111
Extinguisher, Fire, Carbon Dioxide: Charged: Hand: Cylinder, 15 lbs	112
Extinguisher, Fire Monobromotrifluoro- methane, Charged: Hand with Bracket ...	112
Extinguisher, Fire, Multipurpose Dry Chemical	112

F

Face Shield, Industrial, Hinged Window	40
Face Shield, Industrial, Nonhinged Window	40
Face Shield, Plastic (Riot Control)	40
Filter for Supplied Air Mask or Respirator	30
Filter, Particulate, 3CFM, M14	81
Filter Unit, Gas Particulate	86
First Aid Kit: General Purpose	160
Flag, Warning	147
Flashing Lights and/or Flares	147
Flashlight, Safety, EP Type	113
Floodlight, Portable, Battery Type, Explosion Proof	113
Floor Finish, Antiskid	160
Floor Tread, Abrasive, Fabric or Plastic	161
Fog Light	148

Fountain, Eye, and Face, Wash Station87

G

Galvanometer98

Gasoline Safety Set141

Glasses, Safety, Spectacle Type41

Glasses, Shooting Amber with Case41

Glasses, Sun, Clip-on41

Glasses, Sun, Spectacle Type41

Glove Inserts: Electrically
Heated122

Glove Shells: Flyers: Sheepskin
Dark Brown75

Glove Shells: Leather, Black and
Glove Inserts: Wool Knit122

Glove Shells, Leather, Gauntlet
Type99

Glove Shells: Leather, Cork Color,
Lineman's99

Glovebox, Controlled Atmosphere:
Laboratory Type82

Gloves, Arm-Length, Synthetic
Rubber81

Gloves, Barbed Tape-Wire Handlers:
Men's, Cowhide, Gauntlet Cuff64

Gloves, Cloth: Canton Flannel, Latex-
Coated, WP, Gauntlet Cuff65

Gloves, Cloth: Men's, Natural
Asbestos65

Gloves, Cloth: Men's, Natural65

Gloves, Cloth: Women's, Work, Cotton
Flannel, Natural65

Gloves, Cloth: Work Type64

Gloves, Cloth: Work Type, Cotton Knit,
OG109, Untreated65

Gloves, Cloth: Cotton, White,
Film Handlers65

Gloves, Cloth: Leather Palm
Gauntlet66

Gloves, Firemen's: Asbestos,
Aluminum Coated, Gauntlet Cuff111

Gloves, Flyer's: Nylon, Fire Retardant,
Type GS/FRP-275

Gloves, Latex, Surgical66

Gloves, Leather: Gauntlet Cuff,
Barbed Wire66

Gloves, Leather: Heavy Leather,
Steel Sewed66

Gloves, Leather: Reinforced with
Steel Palm and Fingers66

Gloves, Leather, Men's, Lineman's98

Gloves, Leather: Strap Closure,
Cream, M195066

Gloves, Leather, Welder's113

Gloves, Leather: Work-Type,
Goatskin, Snug Fitting67

Gloves: Plastic-Coated, Impermeable,
Gauntlet Cuff67

Gloves, Rocket Fuel Handler's: Cotton
Knit, Polyvinyl, or Vinyl Coated144

Gloves, Rubber: Acid and Alkali
Resistant, Black, Type I67

Gloves, Rubber: Aromatic, Fuel-
Resistant, Black, Type II67

Gloves, Rubber, Gauntlet68

Gloves, Rubber, Men's, Heavy-
Weight, Class 198

Gloves, Rubber: 3,000-Volt Protection, Class B	99
Gloves, Rubber: Natural, Above 3,000-Volt Protection	99
Gloves, Rubber: 5,000-Volt Protection, Class 3	99
Gloves, Rubber: Organic, Solvent-Resistant, Type III	68
Gloves, TAP, Men's Butyl Rubber	83
Gloves, TAP, M4	92
Gloves, Wire Mesh: Meat Cutter's	68
Gloves, X-Ray Protective Plastic	132
Goggles, Chemical Splash	87
Goggles, Dust, with Either Clear or Green Frame and Lens for Prescription Glasses	41
Goggles, Eyecup, Protective, Chippers and Grinders	43
Goggles, Eyecup, Protective, Welders	43, 113
Goggles, Laser	132
Goggles, Melter's, Blue Lenses, Several Densities	133
Goggles, Sun, Wind, and Dust	43
Goggles, Industrial	43
Guard, Desiccator	161
Guard, Protective: 3-Finger Leather	68
Guard, Protective Foot	60
Guard, Protective Cuff	53
Guard, Protective, Leg Climbers, Lineman, Iron	99

Guard, Protective Shin	53
Guard, Protective: Shin and Leg	53

H

Harness, Safety, Industrial	71
Hat and Insect Net	37
Hat, Protective Aluminum	37
Hat, Safety, Lineman's	99
Helicopter, Operations	158
Helmet, Armored Vehicle, Crewman	37
Helmet, Construction Workers	38
Helmet, Crash, Motorcyclist's	38
Helmet, Fireman's, Plastic Shell	113
Helmet, Flyers: Crash-Type , Glass Outer Shell OG106	75
Helmet, Hood or Mask, Abrasive Blasting	26
Helmet Sandblasting: With Air Hose	26
Helmet, Sun	122
Helmet Type Ear Protectors	45
Helmet, Welder's	38
Helmet, Welder's: with Protective Fiber Liner	114
Helmet, Welder's, with Instant Release Attachments	114
Hoist	155
Hood, Cold Weather: Cotton Nylon Nylon WR Sateen OG107 Woman's	121
Hood, Cold Weather, WR, OG107	123
Hood, Extreme Cold Weather: Cotton Nylon OG107 w/Fur Ruff	124

Hood, Fire Fighters Glass Fiber Cover	114
Hood, Fireman's: Asbestos, Aluminum Coated, Fire Retardant	111
Hood, Fume, Laboratory	161
Hood, Gas Mask, TAP, Double Coated and Single Coated	83
Hood, CB Mask, Aircraft ABC, M17	23
Hood, Mask, Field Protective M6	25
Hood, Mask, Field Protective M6A2	25
Hood, Mask, Tank Protective, ABC M5	24
Hood, Rocket Fuel Handler's: Full Protection	144
Hood, Rocket Fuel Handler's: Limited Protection	144
Hook, Hoist, Safety	155
Hook, Safety Attachment, Hoist	155
Hooks, Special Purpose and Capacities	156
I	
Ice-Removing Materials	161
Impermeable, Supplied Air, Protective Outfit, M5	91
Impinger, Midget, Hand Operated	16
Impregnate-in-Clothing Test Kit ABC-M2	88
Indicator, Combustible Gas, Portable, Dual Range with Probe	114
Indicator, Oxygen Deficiency	11
Insect Bar: Field Type	37
Insect Net Hat	37

Insect Net Head	37
Insect Repellant, Clothing and Personal Application	161
Insecticide, Aerosol, Synergized Pyrethrins	161
Insecticide, Lindane, Powder, Dusting	162
Insulation Test Set AN/PSM-2	115
J	
Jacket, Flyer's: Man's Lightweight Nonmelting	75
Jacket, Flyer's: Man's Medium Weight Nonmelting	75
Jacket, Safety, Oil- and Acid-Protective	53
Jacket, Safety, Welder's, Leather	114
K	
L	
Ladder, Jacobs: Steel Rungs, 16 in. Wide	72
Lamp, Hand, Portable, Explosion Proof	114
Lamp, Miner's Cap, Safety	36
Lanyard	72
Laser, Protection	133, 137
Leather Dressing, Vesicant Gas Resistant, M2	85
Leggings, Protective, Industrial Knee- or Hip-Length, Acid-, Alkaline-, Oil-, Solvent-Resistant	53
Leggings, Protective, Industrial, Hip-Length Water- and Chemical-Resistant	53

Mask, Riot Control Agent: M28	25	Mittens: Set, Arctic, Gauntlet Style With Leather Palm	123
Mask, Scott Air Pak or Equivalent	21	Mitten Shells: Cotton White	124
Mat, Blasting	115	Mitten Shells: Trigger Finger, Leather Palm and Thumb	124
Mat, Metal Link	162	Mover, Lamb, Air	141
Mat, Plastic Link	162	Multimeter	100
Mat, Rubber Link	162		
Mat, Wood Link	162	N	
Mattress, Pneumatic: Nylon Coated Two Sides	123	Net, Safety	72
Meter, Air Velocity	163	Net Save-All	73
Meter, Foot Candle, Photoelectric: ME-86/U	163	Noise-Measuring Instrument: Audio Dosimeter and Readout Unit	46
Meter, Kit, Air Flow Rate Indicating	163	Noise Survey Meter	46
Meter, Mercury Vapor	14		
Meter, Static	115	O	
Meter, Sound Level (Noise Survey Meter)	45	Octave Band Noise Analyzer	46
Meter, Survey, GM Type, Beta-Gamma	133	Ohmmeter	100, 115
Meter, Survey, PC Type, Alpha	133	Ointment Protective Vesicant Agent, M5	88
Military Police Safety Traffic Control Ensemble	149	Ointment, Sunburn, Protective	163
Mirror, Emergency Signaling: With Foresight	75	Overalls, Safety: Oil- and Acid-Protective, Bib-Type, Infrared-Protective	53
Mirror, Rear View, Wide View, Glare Reducing	149	Overshoes, Men's: Rubber, High- Cleated, 5 Buckle	60
Mirror, Safety	163	Overshoes, Men's: High, NonSkid Sole, 5 Buckle	60
Mitten Inserts: Wool and Nylon Knit, OG, Trigger Finger	123	Overshoes: Nylon, White, Lint- and Dust-Free	60
Mittens, Cloth, Asbestos	68, 115	Overshoes, Women's: Ankle Height, Gray Vinyl Plastic	60
		Overshoes, Women's: High, Black Vinyl Plastic	60

P

Pad, Eye Steel 4 x 11 In.	157	Radiac Set, AN/PDR-60	135
Pads, Knee, Industrial: Moisture- and Heat-Resistant	54	Radioactive Source Set, M3A1	134
Paint, Luminous: Phosphorescent	163	Radiation Warning Signs	137
Pants and Shirt, Fire Resistant Synthetic Fiber	115	Ramp, Inclined, Portable	157
Parka, Extreme Cold Weather: Man's, Cotton Nylon, OG with Hood	124	Ramps, Special Purpose and Capacities (Vehicle Loading)	157
Parka, Insulated, Extreme Cold Weather Green with Fur Ruff	75	Reflector, Reflex, Truck and Bus	149
Parka, Wet Weather: Fireproof Exterior Fabric with Removable Liner	54	Regulator for Supplied Air Mask or Respirator	29
Piton, Mountain Type	125	Respirator, Aerosol Filter, Twin-Cartridge	28
Plate, Cover, Glass, Clear, Welding Protection	115	Respirator, Air Filtering Paint Spray	26
Potentiometer	100	Respirator, Air-Filtering, Particulate-Removing	28
Protective Outfit, Impermeable, Supplied Air Ensemble, M5	91	Respirator, Paint Spray	26
Protectors, Arm, Extension Type, for Wrist Protection	54	Respirator, Chemical Cartridge	28
Psychrometer	163	Respirator, Continuous-Flow Air-Line	27
Pulse Counter, Portable	133	Respirator, Demand-Flow Air-Line	27
Pyrometer	163	Respirator and Gas Masks, Pesticides	28

R

Radiacmeter, IM-9E/PD	133	Respirator, Lightweight, Chemical-Cartridge	27
Radiacmeter, IM-93/UD	133	Respirator, Lightweight, Particle Removing	28
Radiacmeter, IM-147/PD	134	Respirator, Mouthpiece	29
Radiacmeter, IM-174/PD	134	Respirator, Radioactive Dusts, Fumes, Mists, Filter Type	29
Radiacmeter, IM-156/PD	134	Ring Buoy, Lifesaving: Cork, 24 Inch OD	73
Radiac Set, AN/PDR-27Q	134	Ring Buoy, Lifesaving: Cork, 30 Inch OD	73

Ring Buoy, Lifesaving, Plastic, 30 Inch OD	73
Rocket Fuel Handlers, Full Protection Ensemble	144
Rocket Fuel Handlers, Limited Protection Ensemble	144
Rodent Survey Set No. 1	164
S	
Safety Can	141
Safety Can, Steel, 5 Gal	142
Safety Insoles	61
Safety Equipment Set	142
Safety Link Crane	157
Sampler, Air, Dust and Fume, Electrostatic	15
Sampler, Dust, Hand-Operated: Pump Type With Nine All-Glass Impinger Flasks	16
Sampling and Analyzing Kit, CB Agent, ABC-M19	13
Sampling Kit, CB Agent, M34	12
Sandal: Strap On	60
Screen, X-Ray Protective, Folding, Field	135
Screen, X-Ray Protective, Mobile	135
Searchlight, INDC	157
Shackles: Special Purpose and Capacities	157
Shield, Safety, Glass or Plastic	164
Shirt, Flyer's: Men's, High Temperature Resistant-Nylon Twill, OG106	75

Shirt, Safety, Oil-and Acid-Protective: Fire-and Water-Resistant	54
Shirt, Cold Weather: Wool- Nylon Flannel, OG106	125
Shirt, Sleeping, Heat Retentive and Moisture Resistant: Pullover	125
Shirt, Woman's: Wool Flannel, OG108	125
Shelter Half, Tent: Cotton Duck, Olive Green	125
Shoe, Safety: Lineman's, Nonconductive	100
Shoe, Safety, Conductive Sole	115
Shoes, Green, Conductive Canvas, Nonskid Sole	61
Shoes, Ladder, Safety	164
Shoes, Molder's: High, Congress, Leather, Nonmarking Sole	61
Shoes, Nonsparking: High Blucher, Leather	61
Shoes, Nonsparking: Traction Tread Sole and Heel, Mildew Resistant	61
Shoes, Rubber, Safety Toe	61
Shoes, Safety: Clog, Conductive	62
Shoes, Safety: Industrial	62
Shoes, Safety, Oil and Acid Protective	62
Shoes, Safety: Oil and Acid Protective, Nonsparking, Safety Toe	62
Shoes, Shower, Wooden	62
Shower, Emergency	87
Shower Unit, Safety, Rocket Pro- pellant, Neutralizer	142

Signal Kit: Personnel, Distress, Red, M185	76	Socks, Men's, Wool, Cushion Sole, OG408, Stretch Type, Chemical Protective	83
Sign, Safety	164	Spat: Protective	63
Signs, Signals, and Barricades	150	Stair Tread, Antislip, Rubber or Synthetic	164
Skiff, Oar Propelled, Wood, 14 ft. Long	73	Stair Tread, Rolled Metal	164
Ski: Military, All Terrain	125	Stall: Finger, Leather	68
Sleeping Bag: Intermediate Cold	125	Steering Aid, Industrial Truck	149
Sleeping Bag: Extreme Cold	125	Step, Truck	157
Sleeve, Cape and Bib Welders: Flameproof	54	Stepladder, Safety Platform	164
Sleeve, Dog Attack Training	55	Stick, Switch	100
Sleeve, Nuclear, Radiation Protective	135	Stopwatch	165
Sleeve, Traffic Control Reflective	150	Strip, Safety, Telephone and Electric Lines	165
Sleeve, Welder's Leather, Natural Color	116	Sunglasses: Man's Spectacle Type, HGU-4P	76
Sling Chain, Release	157	Suit, Chemical Protective	91
Sling Chain, With Overload Warning Link	157	Suit, Fire Fighters, Aluminum Asbestos	110
Slings: Special Purpose and Capacities	157	Suit, Radiation, Electromagnetic	135
Snowshoes: Bear Paw Type	125	Suit, Radiation Hazard, Disposable	135
Snowshoes: Trail Type, Wood Frame	125	Suit, Rescue, Acid	87
Snowshoes: Trail Type, Magnesium Frame, Without Bindings	126	Suit, Switcher's	101
Socks, Men's: Cotton Nylon, Black Shade, 94 Stretch	62	Suit, Tear-Off	116
Socks, Men's: 25% Cotton, 75% Wool	62	Suit, Utility	55
		Sunscreen, Ointment	165
		Survival Kit, Individual: Cold Climate	76, 126

Survival Kit, Individual: Cold Climate, for OV-1 Aircraft	76	Tool Kit, Survival: Type IV, With Carrying Case	76
Survival Kit, Individual: Hot Climate	76, 126	Tools, Nonsparking	142
Survival Kit, Individual: Hot Climate OV-1 Aircraft	76	Toxicological Agents, Protective Ensemble	91
Survival Kit, Individual: Overwater	76	Trainer, Dog Attack	55
Survival Kit, Overwater, OV-1 Aircraft	76	Trousers, Camouflage: Cotton-Nylon, Water Repellent	126
Survival Kit, Individual: Vest Type, C/O Components	76	Trousers, Cold Weather: Cotton- Nylon, OG107	126
Survival Kit, Individual Vest: Large	76	Trousers, Cold Weather: Wool Serge, OG108	126
Survival Kit, Individual Vest: Small	76	Trousers, Dog Attack Training	55
Survival Kit, Seat: Cold Climate	76	Trousers, Extreme Cold Weather: Cotton-Nylon, Wind Resistant Sateen	126
Survival Kit, Seat: Hot Climate	76	Trousers, Firemen's: Asbestos, Aluminum Coated, Fire Resistant/Water Repellent	111
Survival Kit, Seat: Overwater	76	Trousers, Fireman's, OG, Flame Re- sistant/Water Repellent	116
Sweatband: Adjustable White	116	Trousers, Flying Men's: High Temperature Resistant, Nylon Twill, OG106	77
T		Trousers, Hot Weather: Cotton, Wind Resistant, Poplin	127
Tape, Luminous	165	Trousers, Insulated, Extreme Cold Weather: Green WRT	77
Tent, Arctic, 10 Man	126	Trousers, Safety: Oil and Acid Protective, Fire and Water Resistant	55
Tent, Mountain: With Component	126	Turban, Protective Headdress, Wrap Around, Blue Denim, Flameproof	116
Test Kit, Impregnate-In-Clothing, ABC-M2	88	U	
Tester, Ground Resistance	101	Undershirt, Extreme Cold Weather: Thermal or Insulated	127
Tester, Shoe Conductivity	101	Undershirt, Man's, Cotton	56
Tester, Ventilation, Smoke Tube Assembly	165		
Tongs, Small Objects	166		

Undershirt, Man's: 50% Cotton, 50% Wool, Full Sleeves	127
Undershirt, Man's: Wool Knit, Silver Grey	127
V	
Valve, Ear	46
Vehicle Flags	149
Vesicant Agent, Protective Ointment, M5	88
Vesicant Gas Protective Ensemble	88
Vest, Safety: Reflective Orange Fabric	150
Voltmeter, Portable	101

W

Watch, Stop	165
Water Testing Kit, Bacteriological	82
Water Testing Kit, Chemical Agents, AN—M2	88
Wet-Bulb Globe Temperature Kit	127
Wind-Measuring Set: AN/PMQ—3, A, C and D	127
Winterization Kit, Field, Protective Mask, M4	127
Winterization Kit, Tank, Protective Mask, M3	127
Winterization Kit, Protective Mask, M1	127

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